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AIR POLLUTION ASPECTS OF EMISSION SOURCES: PRIMARY LEAD PRODUCTION

A BIBLIOGRAPHY WITH ABSTRACTS

ENVIRONMENTAL PROTECTION AGENCY

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Air Pollution Technical Information Center

ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Water Programs
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Research Triangle Park, North Carolina

June 1973

The AP series of reports is published by the Technical Publications Branch of the Information Services Division of the Office of Administration for the Office of Air Quality Planning and Standards, Environmental Protection Agency, to report the results of scientific and engineering studies, and information of general interest in the field of air pollution. Information reported in this series includes coverage of intramural activities and of cooperative studies conducted in conjunction with state and local agencies, research institutes, and industrial organizations. Copies of AP reports are available free of charge to Federal employees, current contractors and grantees, and nonprofit organizations - as supplies permit - from the Air Pollution Technical Information Center, Environmental Protection Agency, Research Triangle Park, North Carolina 27711, or from the Superintendent of Documents.

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AIR POLLUTION ASPECTS OF EMISSION SOURCES: PRIMARY LEAD PRODUCTION— A BIBLIOGRAPHY WITH ABSTRACTS

INTRODUCTION

The Air Pollution Technical Information Center (APTIC) of the Office of Air Quality Planning and Standards prepared, selected, and compiled the abstracts in this bibliography. The abstracts are arranged within the categories listed in the Contents. The abstracted documents are thought to be representative of available literature, and no claim is made to all-inclusiveness.

The subject and author indexes refer to the abstracts by category letter and accession number. The author index lists all authors individually; primary authorship is indicated by an asterisk. Generally, higher accession numbers have been assigned to more recent documents.

Current information on this subject and many others related to air pollution may be found in APTIC's monthly abstract bulletin.*

All of the documents abstracted by APTIC are currently on file at the Air Pollution Technical Information Center, Office of Air Quality Planning and Standards, Environmental Protection Agency, Research Triangle Park, North Carolina 27711. Readers outside of the U.S. Environmental Protection Agency may seek the documents directly from publishers, from authors, or from libraries.

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* Air Pollution Abstracts, Superintendent of Documents, U.S. Government Printing Office, Washington, D. C. 20402. Includes more than 6300 abstracts and subject and author indexes in each issue, and two separate cumulative indexes. Subscription price: $27.00 per year; $6.75 additional for foreign mailing.

A. EMISSION SOURCES

03982

B. Bryk, R. Malmstrom, E. Nyholm

FLASH SMELTING OF LEAD CONCENTRATES. J. Metals (Japan) 18, (12) 1298-9, Dec. 1966.

Encouraged by the good results of flash smelting processes, the Outokumpu Co. has worked on developing a flash smelting process for sulfidic lead concentrates. Beginning with laboratory experiments and followed by testing the different smelter units on a pilot-plant scale, the company was ready by 1964 to build a pilot-plant including all units necesary for the complete process. The process and its reactions are described. The pilot plant equipment for drying of the lead concentrate, its cyclone, and the air preheater are discussed.

08147

Pakhotina, N. S.

SANITARY-HYGIENIC EVALUATION OF INDUSTRIAL EMISSIONS BY A ZINC-LEAD COMBINE. In: Survey of U. S. S. R. Literature on Air Pollution an Related Occupational Diseases. Translated from Russian by B. S. Levine. National Bureau of Standards, Washington, D. C., Inst. for Applied Tech., Vol. 3, p. 93-97, May, 1960. 6 refs. CFSTI: TT 60-21475

The degree of atmospheric air pollution and vegetation pollution by the discharges of lead-zinc combine and the distance over which such pollution extended was investigated.It should be mentioned at this point that according to N 101-54 the sanitary-clearance zone around lead-zinc combines must be 1000 m wide. The lead-zinc combine under investigation had the following departments; a) premetallurgical production of lead from enriched ore concentrates; b) production of zinc by the continuous aad intermittent processes of pyrite cinders leaching and the utilization of tailings, such as zinc cakes, sands, etc.; c) production of sulfuric acid by the contact method from SO2 formed in the process of calcining the zinc concentrates. Samples were collected by the sedimentation and aspiration methods. Determinations were made for lead, arsenic and SO2. Soil samples were analyzed for pH, moisture content, H2SO4, and total lead and arsenic; plant samples were analyzed for lead, arsenic and H2SO4. Samples were taken 150 m to 5,000 m away from the emission source. For control purposes, samples were also taken 16 km away. Industrial discharges of the lead-zinc combine heavily polluted the atmospheric air with SO2, lead and arsenic at all distances from the combine at which samples were taken. The degree of soil and plant pollution with lead and arsenic over the three years of the combine0s operation considerably exceeded the content of lead and arsenic in the soil and on plants of the control region. Under such pollution conditions the prescribed sanitary clearance zone of 1000 m proved inadequate as a sanitary protection measure.

10749

Gobson, F. W.

NEW BUICK LEAD SMELTER INCORPORATES FORTY YEARS OF TECHNICAL ADVANCES. Eng. and Mining J., 169(7):62-67, July 1968.

Four significant innovations in the design and operation of lead smelters will be combined for the first time when the new Buick complex goes on stream this year near Bixby, Mo. The plant, designed to produce 100,000 tpy of 99.99% lead, will feature: updraft sintering, air pollution control through production of sulfuric acid, continuous tapping of molten lead, and vacuum dezincing. While none of these processes is new, this will be the first plant to utilize all four.

12074

Rohrman, F. A., and J. H. Ludwig

SULFUR OXIDES EMISSIONS BY SMELTERS. J. Metals, 20(12):46, Dec. 1968.

Sulfur dioxide and trioxide are emitted during the roasting and smelting of most copper, lead, and zinc concentrates. The 32 major smelters in the U. S. account for roughly 12.2% of the total emissions of SO2 in the country. This is a brief review of some of the statistics.

12751

McKee, Arthur G. and Co., San Francisco, Calif., Western Knapp Engineering Div.

SYSTEMS STUDY FOR CONTROL OF EMISSIONS. PRIMARY NONFERROUS SMELTING INDUSTRY. (FINAL REPORT). VOLUME II: APPENDICES A AND B. Contract PH 86-65-85, Rept. 993, 88p., June 1969. 72 refs. CFSTI: PB 184 885

A systems study of the primary copper, lead, and zinc smelting industries is presented to make clear the technological and economi factors that bear on the problem of control of sulfur oxide emissions. Sulfur oxide emissions for various types of smelting operations are tabulated, including gas flows and compositions and an analysis of sulfur oxides generation and recovery. Smelter flow diagrams are presented for the control methods of contact sulfuric acid, absorption, reduction to elemental sulfur, lime wet scrubbing, and limestone wet scrubbing. Sulfur oxide recovery processes that were investigated and rejected as not being suitable for economic analysis are listed. Cost estimates for various control processes are given.

12823

McKee, Arthur G. and Co., San Francisco, Calif., Western Knapp Engineering Div.

SYSTEMS STUDY FOR CONTROL OF EMISSIONS. PRIMARY NONFERROUS SMELTING INDUSTRY. (FINAL REPORT). VOL I. Contract PH 86-65-85, Rept. 993, 188p., June 1969. CFSTI: PB 184 884

A systems study of the primary copper, zinc, and lead smelting industries is presented to make clear the technological and economic factors that bear on the problem of control of sulfur oxide emissions. The nature of smelting practice is described, and potential air pollution problems in smelter areas are revealed. Five processes for the control of sulfur oxides are presented, including contact sulfuric acid, absorption, reduction to elemental sulfur, lime wet scrubbing, and limestone wet

scrubbing. Current sulfur oxide emissions from U. S. smelters are given, and forseeabl emission trends are discussed. Markets for sulfur byproducts are mentioned, the costs of control by available methods are tabulated, and control method evaluation with plant models is considered. A research and development program for control methods and smelting process technology is recommended.

24285

Swain, Robert E.

SMOKE AND FUME INVESTIGATIONS. A HISTORICAL REVIEW. Ind. Eng. Chem., 41(11):2384-2388, Nov. 1949. 18 refs.

Several outstanding cases of injury to animal and plant life by emanations from industrial plants at Ducktown, Tenn., Anaconda, Mont., Salt Lake City, Utah, and Trail, B. C. are cited in a historical survey of atmospheric pollution and the steps that have been taken to prevent and combat it. Sulfur dioxide from two copper smelters was the offender in Ducktown, reaching for 30 miles across the broad-leafed forests of northern Georgia. A crisis came when Georgia brought suit against Tennessee to compel it to cancel the franchise of the smelting companies, but out of this came the design, erection, and successful operation of an adaptation of the lead chamber process to convert SO2 from copper smelting operations to sulfuric acid. With the installation at the Anaconda smelter in 1910 of an enormous Cottrell system for electrical precipitation of solids, one of the most remarkable cases of injury to livestock by smelter smoke ever recorded passed into history. The emissions from the low stacks of an old plant operated at a neighboring location had killed all vegetation, and losses of livestock by arsenical poisoning had been heavy over the near-lying area. A new smelter was erected with stacks over 300 feet tall, but there were still emitted daily 2300 tons of SO2, 200 tons of sulfur trioxide, 30 tons of arsenic trioxide, 3 tons of zinc, and over 2 tons each of copper, lead, and antimony trioxide. Lead and SO3 fumes were soon put under complete control in Utah by liming and bag filtration, and by electrical precipitation. About $13,000,000 was invested at Trail in recovering airborne wastes and converting them to marketable by-products. These were tied together into a smoothly operating system and soon phosphate fertilizers of several types, ammonium sulfate, and sulfur were being produced on a large scale. Contributions of research and diurnal fumigation are also discussed.

26441

Oglesby, Sabert, Jr. and Grady B. Nichols

A MANUAL OF ELECTROSTATIC PRECIPITATOR TECHNOLOGY. PART II -- APPLICATION AREAS. Southern Research Inst., Birmingham, Ala., NAPCA Contract CPA 22-69-73, 875p., Aug. 25, 1970. 118 refs. NTIS: PB 196381

The application of electrostatic precipitators is reviewed for the electric utility industry, the pulp and paper industry, the iron and steel industry, the rock products industry, the chemical industry, in cleaning municipal incinerator dusts, for the petroleum industry, and in the nonferrous metals industry. Particular emphasis is placed on the dust and gaseous emissions of the processes discussed. This is followed by a tabulation of input and design parameters for precipitators operating on various types of dust control problems and an analysis of critical design parameters and test results. Cost data are also presented. The electrolytic reduction of aluminum, the production of copper, primary lead, and zinc reduction are discussed in the area of the nonferrous metals industry. In the petroleum industry, catalytic cracking and detarring are indicated as application areas. Refuse properties are discussed, as well as types of incinerators. Sulfuric acid production, the production of elemental phosphorus, phosphoric acid, and carbon black, warrant the use of precipitators in the chemical industry. In the rock products industry, the manufacture of Portland cement and the gypsum industry present problems. Coke ovens, sinter plants, blast furnaces, open hearth furnaces, basic oxygen converters, electric arc furnaces, scarfing machines, and iron cupolas are areas of application in the iron and steel industry. In the pulp and paper industry, precipitators are indicated for the recovery of boiler particulate emissions and sulfate process flue gases. Fly ash precipitators are needed in the electric utility industry.

26891

Patterson, C. C.

LEAD. Preprint, California Inst. of Tech., Pasadena, Div. of Geological Sciences, 17p., 1970 (?). 37 refs.

Beginning with the Industrial Revolution, world lead production climbed from 100,000 tons/yr in 1750 to 3,500,000 tons/yr in 1966. The rise in production is summarized in a table of the tons of lead smelted or burned as alkyls per yr since 1750. Industrial lead, which until recently was recognized as only an occupational health hazard, enters the oceans by rivers and by atmospheric aerosols. Contributions from both routes gradually increased during past centuries, but pollution from the atmosphere increased abruptly during the last two decades as a consequence of the increased use of leaded automotive fuels. It is likely that man has polluted the mixed zone of northern hemisphere oceans with industrial lead to such a degree that most of the lead originally there has been displaced. It is also probable that the average lead concentration in these oceans has been elevated by a factor of two or three, with a subsequent elevation of the lead body burden in higher organisms near the ends of the food chain. Tentative estimates of lead concentrations in the 100 meter surface layer of northern hemisphere oceans and at 200 meters are 0.25 and 0.12 gamma Pb/kg water, respectively.

29572

Paluch, Jan and Stanislaw Karweta

AIR POLLUTION BY LEAD AND ZINC IN THE AREA OF COMBINED METALLURGICA WORKS AND ITS INFLUENCE ON VEGETATION AND SOIL. (Die Luftverunreinigung durch Blei und Zink im Bereich eines metallurgischen Kombinates und ihr Einfluss auf Vegetation und Boden). Text in German. Wiss. Z. Humboldt Univ. Berlin Math. Naturw. Reihe, 19(5):495-497, 1970.

A study was made for over three years in the area of a large non-ferrous metals plant that started operations in 1966, and which was located in a formerly very clean wooded area. Its production includes zinc oxide and lead; by-products include sulfuric acid and ammonium sulfate. The zinc oxide melting furnaces emit about 30 tons of gas per month, containing about 50% zinc plus lead. Additional quantities of zinc and lead dust in the air originate from the charging of the furnaces with powdered raw material, from transportation and handling of scrap material, from the sintering plant for zinc-lead ores, and from the shaft furnace in which the metal oxides are reduced to metals. A distinct increase in dust fall and air pollution in the areas adjacent to the plant was observed, reaching a peak two years after start of operations, and then leveling off. Emission of zinc- and lead-bearing dust into th air was found to cause an accumulation of these metals in the soil and in plants, the accumulation in the soil was observed only in the surface layers. The emission of zinc and lead from the

melting units takes place mainly in the form of oxides which are emitted together with considerable quantities of calcium oxide. The accumulation of these three metal groups leads to soil alkalinity. The process of assimilation of zinc and lead in plants is far more intensive than in the soil.

30447

Nelson, Kenneth W.

NONFERROUS METALLURGICAL OPERATIONS. In: Air Pollution. Arthur C. Stern (ed.), Vol. 3, 2nd ed., New York, Academic Press, 1968, Chapt. 37, p. 171-190. 16 refs.

While sulfur dioxide from the smelting of copper, lead, and zinc has been the principal pollutant of interest in nonferrous metallurgy, gaseous and particulate fluorides from aluminum smelting are also of concern. Fluoride problems first came to attention because of adverse effects on grazing animals rather than effects on vegetation, as with SO2. The mining, milling, and concentrating of copper, lead, and zinc are discussed, as well as their refining and smelting, emissions, and controls. The mining and ore treatment of aluminum is considered, its electrolysis, and emissions and controls. Copper, lead, zinc, and aluminum produced from scrap are also discussed. The production of nonferrous alloys is noted.

30647

Ministry of International Trade and Industry, Tokyo (Japan)

INSPECTION RESULTS OF CADMIUM MINES AND REFINERIES. 1970. (Kadomyumu kanren kozan seirensho no 45 nendo kensa kekka nitsuite). Text in Japanese. Sangyo Kogai (Ind. Public Nuisance), 7(5):250-257, May 1971.

Mines and smelters which handle zinc, copper, or lead were inspected. It is important to control the overall effluent so that its cadmium concentration is within the allowable limit of (0.1 ppm). Of 62 mines inspected, two exceeded the limit with 0.542 ppm and 0.145 ppm respectively. To indicate the individual effluent condition, the maximum and minimum concentrations are shown in tabular form. Three other mines also exceeded the 0.1 ppm limit with 0.125 ppm, 0.14 ppm, and 0.195 ppm, respectively. However, the overall effluent showed less than the standard concentration. Strong supervision is recommended to reduce the seepage from old piles and to reduce the individual effluent at each pit and pile. Two smelters exceeded the standard, with 0.175 ppm and 0.111 ppm, respectively. The water near several mines and smelters was sampled, and four mines exceeded 0.01 ppm. The atmospheric cadmium concentration was also measured. Even under the most unfavorable condition, all were within the standard of 0.88 micrograms /cu m -2.93 micrograms /cu m. The mines and smelters which exceeded the standard were directed to close the pit, repair defective water discharge facilities and neutralize the seepage. A thorough study will be made to clarify environmental pollution by cadmium, distinguishing it from complex pollution.

32567

Dean, R. S. and R. E. Swain

REPORT SUBMITTED TO THE TRAIL SMELTER ARBITRAL TRIBUNAL. PART I OPERATIONAL FEATURES OF TRAIL SMELTER. Bull. Bureau Mines, no. 453:1-22, 1944. 5 refs.

The Trail Smelter Arbitral Tribunal, with powers derived from a convention between the U. S. and Canada, was established to determine whether fumigations from the Trail Smelter in British Columbia were a source of vegetation damage in the State of Washington and, if so, what indemnity should be paid for damages incurred since January 1932. Both lead and zinc concentrates are roasted at Trail, and nearly all the sulfur is converted to sulfur dioxide gas during this process. In 1930, SO2 emissions from the plant reached approximately 20,000 tons/month. Subsequently, emissions were reduced by the construction of sulfuric acid plants, absorption plants, and a sulfur-reduction unit. A detailed description is given of the various smelting operations at Trail and of the sulfur-recovery operations. General topographic and climatic features of the region are briefly reviewed together with smoke-control measures. Data on the total tonnage of sulfur discharged from the plant per month from 1900-1939 are presented.

34068

Djuric, Dusan, Zarka Kerin, Ljubica Graovac-Leposavic, Ljiljana Novak, and Marija Kop

ENVIRONMENTAL CONTAMINATION BY LEAD FROM A MINE AND SMELTER. Arch. Environ. Health, vol. 23:275-279, Oct. 1971. 1 ref. (Presented at the Conference on Inorganic Lead, Amsterdam, Netherlands, Nov. 28, 1968.)

The contamination of a large area in Yugoslavia by lead from a mine and smelter is illustrated in a preliminary report by fragmentary data obtained by the determination of lead in the surrounding air, in the water of a river draining the area, in the soil, and in local vegetation. A screening test (determination of the urinary excretion of delta-aminolevulinic acid) applied to groups in the population suggests that the absorption of lead by members of the groups may be hazardous. (Author abstract)

34788

Proctor, Paul Dean and Thomas R. Beveridge

POPULATION, ENERGY, SELECTED MINERAL RAW MATERIALS, AND PERSONNEL DEMANDS, 2000 A. D. Preprint, Society of Mining Engineers, AIME, N. Y., New York, N. Y., 19p., 1971. (Presented at the American Institute of Mining, Metallurgical, and Petroleum Engineers, Annual Meeting, New York, Feb. 26-March 4, 1971, Paper 71-H-107.)

The people of the United States currently consume 32% of the world s energy and similarly large percentages of the world s mineral raw materials. A minimal two percent increase per year in the standard of living in the United States and a four percent increase elsewhere in the world, beyond the demands of the estimated population increases, suggest the magnitude of the increased need for energy-mineral raw materials and the possible crises the world will face in these areas by 2000 A.D. Iron ore, copper, lead, and zinc, sulfur, and fertilizer consumption and projections are considered. Better trained and increased manpower needs are also indicated.

34916

Bureau of Census, Washington, D. C.

PRODUCT CLASSES - VALUE SHIPPED BY ALL MANUFACTURING ESTABLISHMENTS: 1947, 1954, 1958, 1963 TO 1967. In: Smelting and Refining of Nonferrous Metals and Alloys. p. 33C-29, 1970.

Quantities shipped by all manufacturing establishments of copper, lead, zinc, aluminum, primary nonferrous metals, and secondary nonferrous metals are tabulated for 1947, 1954, 1958, and 1963 to 1967. Both smelter and refined materials are included.

34921

Bureau of Census, Washington, D. C.

MATERIALS CONSUMED, BY KIND: 1967 AND 1963. In: Smelting and Refining of Nonferrous Metals and Alloys. p. 33C-31, 1970.

The quantity consumed in the smelting and refining of nonferrous metals and alloys of aluminum ingot, aluminum and aluminum-base alloy scrap, copper, lead, zinc, and tin is listed for 1963 and 1967. Delivered costs are also indicated.

35224

Halley, James H. and Bruce E. McNay

CURRENT SMELTING SYSTEMS AND THEIR RELATION TO AIR POLLUTION. Preprint, American Inst. of Chemical Engineers New York and Inst. Mexicano de Ingenieros Quimicos, 20p., 1970. 5 refs. (Presented at the American Institute of Chemical Engineers and Institute Mexicano de Ingenieros Quimicos, Joint Meeting, 3rd, Denver, Colo., Aug. 30-Sept. 2, 1970.)

The non-ferrous smelting operations, using metallic sulfides as feed material, are briefly described. These include copper, lead, and zinc smelting. Conditions and the nature of waste gas streams are discussed in relation to extraction and recovery of sulfur. Major problems of high temperatures, unclean gases, and low sulfur oxide concentration are noted. Possible changes in equipment and processes are discussed, as well as the manufacture of sulfuric acid from relatively strong sulfur dioxide waste gas. (Author abstract modified)

39462

Midwest Research Inst., Kansas City, Mo.

PARTICULATE POLLUTANT SYSTEM STUDY. VOLUME III - HANDBOOK OF EMISSION PROPERTIES. Air Pollution Control Office Contract CPA 22-69-104, MRI Proj. 3326-C, 626p., May 1, 1971. 302 refs.

Details of the methodology employed to obtain data concerning the kind and number of stationary particulate sources, the chemical and physical characteristics of both the particulates and carrier gas emitted by specific sources, and the status of current control practices, are presented. Emission factors and rates, chemical and physical properties of effluents, and control practices and equipment are given for stationary combustion processes (power generation and furnaces); mineral processing; agricultural operations (field burning, grain elevators, cotton gins); iron and steel manufacturing; cement manufacturing; forest products industry (sawmills, pulp industry); primary nonferrous metallurgy (copper, lead, zinc, and aluminum smelting and refining); clay products; fertilizer manufacturing; asphalt; ferroalloy manufacturing; iron foundries; secondary nonferrous metals industry; coal preparation; carbon black manufacturing; petroleum refining; acid manufacture (sulfuric acid and phosphoric acid); and incineration. The control equipment includes cyclones, wet scrubbers, electrostatic precipitators, fabric filters, mist eliminators, and afterburners. Effluents include dusts, particulates, fly ash, sulfur oxides, hydrocarbons, and other noxious gases. Costs for control equipment purchase and operation are given. This handbook constitutes a reference source for available information on the distinguishing features of the various particulate pollution sources and should be of value to air pollution regulatory agencies, control equipment manufacturers, and industrial concerns.

40582

Holmes, J. A., Edward C. Franklin, and Ralph A. Gould

REPORT OF THE SELBY SMELTER COMMISSION. Bull. Bureau Mines, no. 98:1-62,503-520, 1915. 86 refs.

A commission was established to determine whether the Selby Smelting and Lead Co., Contra Costa County, California, was violating court orders restraining the company from emitting uncontrolled sulfur dioxide and smoke to the atmosphere. The commission found that no economic damage was being done by the relatively small daily output of sulfur (24.6-28.3 tons in the first 4 mo of 1914). The blast furnace gave off only invisible gases, the visible part of the smoke was removed by the blast- furnace baghouse. The parting retort stack also gave off only invisible gases, the visible part was removed by a Cottrell electrostatic precipitator. Visible smoke was produced, however, by the roaster stack. This smoke and the sulfur dioxide generated during roasting operations constitute the only nuisance effect of present smelter operations. The company should make efforts to recover the SO2 as sulfur, sulfuric acid, or liquid sulfur dioxide and to remove dust and fumes from the Ropp roaster gases. Diffusion, plant damage, effects on materials, the effects on farm animals, and the attitudes of the residents were discussed.

42676

Ministerium fuer Arbeits, Gesundheit und Soziales des Landes Nordrheim-Westfalen, Duesseldorf (West Germany)

NONFERROUS METALLURGY. (NE-Metallerzeugung). Text in German. In: Reine Luft fuer morgen. Utopie oder Wirklichkeit. Moehnesee- Wamel, West Germany, K. ron Saint George, 1972, p. 60-65.

The present situation and future trends in the output and emissions in the nonferrous metallurgy of North Rhine-Westphalia are described. The aluminum industriy, which accounts for more than 50% of the total output of West Germany, will experience rapid growth. The basic pollutants are gaseous fluorine compounds (0.8-1.5 kg/t), aluminum- and fluorine-bearing dust (9-20 kg/t), sulfur dioxide (3-15 kg/t), and carbon monoxide. Aluminum remelting is expected to increase 100% by 1980. Chloride aerosols, metal oxides, and gaseous fluorine compounds are the chief pollutants. Dust separation at a rate of 15% was applied to rotary furnaces in 1970. Dust emissions will decrease from 1320 tons in 1970 to 680 tons in 1980 by lowering the dust concentration to 150 mg/N cu m and 100 mg/N cu m for rotary furnaces and thermal chips treatment facilities, respectively. Gaseous fluorine emissions, 90 tons in 1970, will be reduced to 50 tons in 1980 by applying wet-type gas cleaning. Sulfur dioxide emissions from lead manufacturing will be reduced 90% due to waste-gas desulfurization. The effciency of SO2 separation at sulfuric acid production facilities is 98%. Lead and zinc emissions, amounting to 350 and 180 tons in 1970, will decrease to 50 tons each in 1975. Sulfur dioxide emissions from copper manufacturing, for which a 2% yearly rate of growth is predicted, will rise from 900 tons in 1970 to 1100 tons in 1980, the waste-gas SO2 concentration being 0.2 g/N cu m. Hydrochloric acid emissions, now 500 tons, will decrease by 50%. While total dust emission will be reduced from 600 to 300 tons, no further reduction in lead, zinc, and copper emissions is possible. The dust emissions from copper alloy manufacturing will be 10% of the 1970 level by 1980, as an upper limit of 50 mg/N cu m will be set in 1973. Sulfur dioxide emissions from zinc manufacturing, for which electrolytic processes are increasingly used, will decrease from 1800 tons in 1970 to about 1500 tons in 1980. The imposition of a maximum allowable dust emission of 50 mg/N cu m in 1973 will result in zinc and lead emissions, now 160 and 40 tons,

decreasing to 80 and 20 tons, respectively, despite a growth rate of 40%.

42726

Worcester, A. and D. H. Beilstein

LEAD - PROGRESS AND PROGNOSIS. THE STATE OF THE ART - LEAD RECOVERY. Preprint, American Inst. of Mining, Metallurgical and Petroleum Engineers, New York, Metallurgical Society, 22p., 1971. (Presented at the American Institute of Mining, Metallurgical and Petroleum Engineers, Annual Meeting, 100th, New York, Feb. 26-March 4, 1971, Paper A71-87.)

Present methods in general use to recover lead metal from its ores, including methods for sintering, heavy smelting, drossing, refining, and emissions control, are described. Baghouses and electrostatic precipitators are the most common dust and fume collectors. In some emission control operations sulfuric acid, cadmium, and thallium are recovered. Probable short and long term advances in the lead recovery process are suggested. The history of lead smelting is briefly reviewed. Lead consumption in the United States in 1970 was 1.267 million tons, distributed as chemicals: 278,000 tons; batteries: 570,000 tons; pigments: 98,000 tons; and metal: 371,000 tons.

43271

Environmental Protection Agency, Research Triangle Park, N. C., Office of Air Programs

METALLURGICAL INDUSTRY. In: Compilation of Air Pollutant Emission Factors. OAP Pub-AP-42, p. 7-1 to 7-22, Feb. 1972. 61 refs. NTIS: PB 209559

Primary and secondary metal industries are discussed. The primary industries, producing metals from ore, reviewed are: non-ferrous operations of aluminum ore reduction, copper smelters, lead smelters, zinc smelters, iron and steel mills, ferroalloy production, and metallurgical coke manufacture. Large quantities of sulfur oxides and particulates are emitted by these industries. The secondary metallurgical industries, which recover metal from scrap and salvage and produce alloys from ingot, include aluminum operations, brass and bronze ingots, gray iron foundries, lead smelting, magnesium smelting, steel foundries, and zinc processing. The major air contaminants from these operations are particulates in the forms of metallic fumes, smoke, and dust. Control methods used are: cyclones, electrostatic precipitators, filters, and baghouses.

45858

Lukey, Michael E. and M. Dean High

EXHAUST GAS CONVERSION FACTORS. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 16p., 1972. (Presented at the Air Pollution Control Assiciation, Annual Meeting, 65th, Miami, Fla., June 18-20, 1972, Paper 72-88.)

The exhaust gas parameters from 76 combustion and industrial sources are given including fuel combustion processes, refuse incineration, mineral industries, chemical industries, metallurgical processes, pulp mills, and refineries. The main objective of the study was to define a relationship of the exhaust gases being emitted, to the process weights. Each of the 76 industrial source factors includes a process description, the potential air contaminants, operating time, abatement equipment, an input-output relationship, and the exhaust gas parameters: gas flow rate, gas temperature, gas velocity, and stack height. An attempt was made to relate the exhaust gas parameters to an input or output quantity. Thus by knowing the production rate of a plant, one can use these exhaust gas source factors and pollutant emission factors to obtain engineering estimates of specific plant emission and its community impact through modeling. Sources include coal, oil, natural gas, and wood combustion, incineration; burners; chemical processes such as ammonia, carbon black, chlorine, hydrofluoric acid, paint, phosphoric acid, plastics, ink, soap, sulfuric acid, synthetic fibers, and rubber production; food and agricultural processes; primary metallurgy; steel, lead, zinc, and aluminum production including sintering, blast furnaces, electric furnaces, and open hearth furnaces; petroleum refining, pulp mills; dry cleaning; and surface coating.

B. CONTROL METHODS

08562

Culhane, F. R.

PRODUCTION BAGHOUSES. Chem. Eng. Progr., 64(1):65-738 Jan. 1968. 1 ref.

Tests and field results are discussed for several baghouse installations associated with roasters, sintering machines, and reverberatory furnaces in the lead, zinc, and copper industries. Design considerations, such as air-to-cloth ratio and type of construction, are discussed. (Authors abstract)

10558

Lange, Alfred and Werner Trinks

THE ELECTRICAL RESISTANCE OF LEAD AND ZINC COMPOUNDS, WITH SPECIAL REFERENCE TO THE GAS PHASE. APPLICATIONS TO ELECTROSTATIC GAS CLEANING. ((Der elektrische Widerstand von Blei- und Zinkverbindungen unter besonderer Berucksichtigung der Gasphase. Ein Beitrag zum Problem der elektrischen Gasreinigung.)) Text in German. Neue Heutte, 12(2):81-88, Feb. 1968. 8 refs.

The use of electrofilters in dust elimination from flue gases in nonferrous metallurgy in many cases is attended by failure due to the poor conductivity of the dust deposited on the filter electrodes. Hence, the determination of the electrical resistance of particular dust types is of interest. The literature on this subject is reviewed and original resistance measurements are reported which utilized a specially constructed apparatus permitting gas phase measurements at temperatures of 400 degrees C. Electrical resistance measurements of lead oxide, carbonate and sulfide are described and illustrated by graphs. The results of these measurements and of deposition experiments with lead oxide and lead sulfate fly ash are detailed. At high temperatures the resistance of lead and zinc compounds lies below the critical limit, thus deposition in a hot-gas atmosphere (EGR) is possible in principle; however, larger quantities of gas and larger filters are consequently required. The reported results suggest that lead oxide fly ash should be deposited in the temperature range of 320 and 380 degrees C., and lead sulfate fly ash at temperatures above 350 degrees C. During the deposition of lead oxide fly ash, the partial oxygen pressure of the gas phase should be as high as possible, in contrast to the conditions required for zinc oxide fly ash. In the deposition of lead sulfate fly ash, especially, the constant presence of SO2 in the gas phase is essential.

21309

Argenbright, L. P. and Bennett Preble

SO2 FROM SMELTERS: THREE PROCESSES FORM AN OVERVIEW OF RECOVERY COSTS. Environ. Sci. Technol., 4(7):554-561, July 1970.

About 2.2 million long tons per year of sulfur is contained in the sulfur oxide gases generated in the operation of copper, zinc, and lead smelters in the western United States. Nearly 23% of this is recovered, mostly as sulfuric acid. A study was made to identify and evaluate the technological and economic problems associated with controlling the sulfur oxide emissions of these smelting operations. Three processes for control and by-product recovery were considered: the contact sulfuric acid process, the Cominco absorption process, and the ASARCO reduction process. All three are adversely affected by the low percentage of sulfur in the exhaust gases. Similarly, all are limited in optimum size, since the capital investment for larger operations off-sets the reduction in operating cost. Of the three processes considered, the contact sulfuric acid process is the least costly, both in terms of initial cost and operating cost.

22889

Haver, F. P., K. Uchida, and M. M. Wong

RECOVERY OF LEAD AND SULFUR FROM GALENA CONCENTRATE, USING A FERRIC SULFATE LEACH. Bureau of Mines, Washington, D. C., Rept. of Investigations 7360, 13p., March 1970. 10 refs. CFSTI: PB 190968

As part of a program to study methods of recovering elemental sulfur from the processing of sulfide ores for both anti-pollution and economic by-product purposes, a procedure is described for recovering lead and sulfur from galena flotation concentrate. The method consists of aqueous oxidation of the concentrate, using ferric sulfate to convert lead sulfide to sulfate and to give elemental sulfur; regeneration of the ferric sulfate by electrolysi in a diaphragm cell; treatment of the leach residue with ammonium carbonate solution to change the lead to an acid-soluble form and to produce ammonium sulfate as a by-product; solution of the lead carbonate in hydrofluosilicic acid followed by electrolysis to recover the lead as metal and regenerate the acid for further use; and extraction of the elemental sulfur from the final residue with an organic solvent. About 90% of the lead can be recovered by the above method as 99.9-%-pure metal, together with two-thirds of the sulfur, half in the elemental form and half as ammonium sulfate. (Author abstract modified)

23530

Lepsoe, R. and W. S. Kirkpatrick

RECOVERY OF SULPHUR FROM SULPHUR DIOXIDE. Pulp Paper Mag. Can. (Quebec), vol. 39:20-22, 54, Jan. 1938. (Also: Trans. Can. Inst. Mining Meet., vol. 15:399-404, 1937.)

Sulfur dioxide recovery operations to produce pure sulfur at a lead and zinc smelting plant are outlined. The production involves three main operations. The first consists of absorption of the SO2 The roaster gas is cleaned and passed through one or more absorbing towers in contact with a solution of ammonium sulfite and ammonium bisulfite, concentrating the gas to about 0.1% SO2 or less. The second step involves liberation of the SO2 gas. The sulfite solution is passed down a packed tower and mixed with sulfuric acid previously used to dry the evolved SO2 gas. At the base of the tower is ammonium sulfate solution with a small amount of SO2 included; the latter is driven off by blowing steam directly into the solution. The third step involved reduction of the SO2 gas to elemental sulfur. The SO2 gas and pure oxygen enter a reduction furnace; on leaving the coke-bed, the gases are mainly CO2 and

elemental sulfur gas, plus carbon oxysulfide and some carbon monoxide. To this is added SO2 to react with the carbon oxysulfid before it passes into the catalyst column where this reaction takes place. From the columns, the gases pass through waste-heat boilers where liquid sulfur is recovered; this liquid is eventually solidified for marketing.

24321

ELEMENTAL SULPHUR. EXTRACTION AND REDUCTION OF SULPHUR DIOXIDE FROM ROASTER GASES AT TRAIL. Can. Chem. Process, 26(3):138-139, March 1942.

Methods adopted for concentrating the sulfur dioxide from zinc and lead roaster gases, and reducing it to elemental sulfur, are described. In the concentration process, cleaned and cooled roaster gas flows either countercurrent or concurrent to a circulating solution of ammonia monosulfite and ammonium bisulfite through four absorbing towers, reducing the SO2 concentration from about 6 to 0.15%. The only product of the absorption systems is a concentrated solution of ammonium bisulfite, from which SO2 is released by two processes, acidification or exorption. The reduction to sulfur is accomplished by passing the concentrated SO2 through incandescent coke and then through catalyst columns. The gaseous sulfur is condensed out as mist and liquid and recovered as liquid in Cottrell treaters. After removal of any occluded carbon from the molten sulfur, it is pumped into storage tanks where it solidifies as a yellow mass of over 99.99% purity.

24553

Welch, Harry V.

COLLECTION OF LEAD AND ZINC DUSTS AND FUMES BY THE COTTRELL PROCESS. Trans. AIME (Am. Inst. Mining, Metallurgical, and Petroleum Engr.), vol. 121:304-338, 1936. 42 refs.

A review of the historical background of Cottrell precipitators and a discussion of the theory of conditioning blast furnace and Dwight-Lloyd gases is followed by a summary of the design, operation, and application of various Cottrells. Included are the exposed pipe, submerged pipe, plate, rod-curtain, screen, and cylindrical-rod designs. Collection of lead and zinc dusts and fumes by the Cottrell process at a selected number of representativ smelters is described.

25275

Nilsson, Folke and Bengt Rudling

AIR POLLUTION CONTROL AT THE BOLIDEN COPPER AND LEAD SMELTING PLANT, ROENNSKAERSVERKEN, SWEDEN. Preprint, International Union of Air Pollution Prevention Associations, 36p., 1970. (Presented at the International Clean Air Congress, 2nd, Washington, D. C., Dec. 6-11, 1970, Paper SU-24D.)

Factors considered when the Boliden Company's copper and lead smelter was erected in Sweden in 1928-1930 are reviewed. Built for smelting copper-arsenopyrite ore from the Boliden mine, the smelter was placed on a peninsula at the Bothnian Gulf. To utilize excess sulfur in the ore as pyrite and thereby reduce the sulfur dioxide emission by about 50%, the ore was concentrated. After World War II a sulfuric acid plant took care of the roaster gases and ten years later the production was increased three-fold by further SO2-utilization. Hereafter no effect can be seen on forest, crop, or garden. The concentration of SO2 in ambient air around the the smelter is far beneath the official limit. The production of liquid SO2 for the paper and pulp industry will now make it possible to utilize over 90% of the SO2. The SO2-recovery is made by absorption in water. This process is economical when a good supply of cold water for cooling and inexpensive surplus steam is available. Along with diversified and increased production, dust cleaning has been extended and modernized. The results of these activities have been followed up by medical studies of the population. (Author abstract modified)

25334

Bainbridge, C. A.

FUME CONTROL AND RECOVERY IN LEAD SMELTING FURNACES. Chem. Process Eng., vol. 41:344-345, 347, 351, Aug. 1960.

Probably the most popular type of gas-cleaning process in the lead industry is the fabric filter because of its high efficiency, economy of operation, and ease of maintenance; it is applied in many forms from the old-fashioned, hand-operated, so-called bag house, requiring a relatively large staff, to the modern, fully automatic, multi-compartment plant run by one man part-time. Despite careful control of the process to produce lead from scrap materials, the high temperature in the furnace inevitably causes some of the lead to evaporate, and the vaporized lead when it leaves the furnace combines with oxygen to form lead oxide. Hood and duct design, the gas-cooling plant, filter plant, and operational experience are discussed for the new production unit of a lead company. Horizontal ducting was used between the furnaces, and provided with an adequate number of cleaning doors and fume hoppers with fitted lids to facilitate regular cleaning. Final design of the cooling section which had to dissipate over 1 million BTU/hr consisted of a series-parallel arrangement of four inverted 'U' tubes mounted on trough section hoppers, connected by a screw conveyor and an isolating valve arrangement for occasions when only one furnace would be in operation. Because of the sticky nature of lead fume, cleaning doors were put at the top of each 'U' tube and on each hopper. Filter plant requirements location of fans, and plant instrumentation are also cited.

25781

Hallows, R. L. and B. M. O'Harra

MODERN AUTOMATIC BAGHOUSES FOR COLLECTION OF LEAD-FURNACE FUMES. Trans. AIME (Am. Inst. Mining Metallurgical and Petroleum Engrs.), vol. 121:299-303, 1936.

A comparison is drawn between automatic and old style baghouses for filtering fumes, based on operating experience with both types in a lead smelter. The modern type is characterized by its small filtering bags and frequency of shaking (usually every few minutes) as opposed to the old type which uses much larger bags shaken at much longer intervals (2-12 hrs apart). Good practice for the modern baghouse calls for only 1 sq ft of filter cloth to handle from 3-8 cu ft of gas per minute; thus, the filtering area may be as little as one-tenth that in the old type for handling the same volume and dust concentration. This is the most striking differenc and probably the greatest single advantage of the new type; others include greater cleanliness and uniform draft conditions due to the frequency of cleaning, more convenient repair of leaks, and lessene danger of fire. Although initial bag equipment costs for the new type are lower, the longer life of a bag in the old baghouse is much longer, so the cost of bag replacement is considerably in favor of the old type. Little trouble or expense is experienced in maintaining the new filters. Operating details are given.

26107

Ichijo, M.

TECHNOLOGY OF POLLUTION-CONTROL IN ZINC AND LEAD SMELTING. (Aen oyobi nanari serien ni okera kogai boshi gijutsu). Text in Japanese. Kinzoku (Metals) (Tokyo), 41(1):118-121, Jan. 1 and 15, 1971.

Cadmium production by zinc smelting is a serious pollution problem, even though the amount generated is very small (about 1/400 of zinc). The pollutant is a source of contamination whether discharged with smelter effluent or contained in solid waste. Though present in an even smaller proportion, cadmium is also found in lead; and both lead and zinc production are increasing. Flow sheets are given for both wet and dry zinc smelting processes and lead smelting processes. Attempts to recover cadmium and recycle it to the smelting operation have not significantly reduced emissions. Currently the effluent is being treated with calcium carbonate or calcium hydroxide. A process for recovering these compounds as sulfides is in the development stage. Other control methods under study are ion exchange, multi-stage flush condensation, and the Duval and cyanide methods used in copper smelting.

26600

HOMESTAKE POLLUTION CONTROL. Mining Mag. (London), 124(1):26-27, Jan. 1971.

Among the innovations claimed for a new smelter producing approximately 100,000 tons of lead concentrate annually is updraft sintering. By blowing a draught of air upward, rather than downwar through the sintering machine, higher lead-content sinter is produced, more sulfur is removed, lead is eliminated in windboxes, and the gas produced is suitable for direct conversion to sulfuric acid. The sulfur dioxide gas from the sinter machine is filtered through a six-compartment baghouse to eliminate dust and metallic fume impurities, cooled in a tower packed with ceramic rings to eliminate excessive water vapor, then passed through an electrostatic precipitator where any remaining fume and dust are removed along with any acid mist. Conversion of the purified SO2 to SO3 takes place on a vanadium pentoxide catalyst; the SO3 produced is absorbed in sulfuric acid. In addition to dust from the sinter machine and primary crushers, the baghouse also handles smoke from two lead blast furnaces and a dross reverberatory furnace. Overall dust and fume recovery is estimated to be in excess of 99%, and there is no visible plume from the stack.

27597

Semrau, Konrad T.

CONTROL OF SULFUR OXIDE EMISSIONS FROM PRIMARY COPPER, LEAD, AND ZINC SMELTERS--A REVIEW. Preprint, Air Pollution Control Assoc., Pittsburgh, Pa., 39p., 1970. 140 refs. (Presented at the Air Pollution Control Association, Annual Meeting, 63rd, St. Louis, Mo., June 14-18, 1970, Paper 70-97.)

The methods of control of sulfur dioxide emissions from primary copper, lead, and zinc smelters are reviewed. The principal barrier to control is economical rather than technical. The processes of copper, lead, and zinc smelting are described. Method for control and useful recovery of sulfur oxide emissions are placed into 3 categories: systems producing sulfuric acid; systems producing concentrated sulfur dioxide, either for use as such or as an intermediate in production of some other materials, such as sulfuric acid or elemental sulfur; and systems producing elemental sulfur. Processes described include a conventional gas cleaning and conditioning system for a sulfuric acid plant consisting of scrubbing towers and a wet-type electrostatic precipitator, the Asarco DMA absorption system, the Cominco ammonia absorption system the Lurgi Sulfacid process, the Monsanto Cat-Ox process, the Boliden process, the Asarco Brimstone process, the TGS process, and the Claus process.

27639

Bainbridge, R.

LEAD BLAST FURNACE GAS HANDLING AND DUST COLLECTION. J. Metals, 4(12):1302-1306, Dec. 1952. (Presented at the American Inst. of Mining, Metallurgical and Petroleum Engineers Regional Meeting, Spokane, Wash., May 1952. Paper TP3406D)

The first stage in a program of modernizing a lead smelter involved the design and construction of new blast furnace cleaning system. The selection of equipment, the design of facilities, and preliminary operating details of this system are described. Provisions were made to cool blast furnace gas down to 210 F by automatically controlled sprays in a two-compartment steel tower. The cooling system uses high-pressure (700 psi water sprays with tempering air. Dust is recovered in a baghouse comprising 20 compartments of 396 Orlon bags each, installed in two banks of 10 compartments. Dust recovery in the baghouse unit has been better than 99% and maintenance and operating costs have been reduced. However, some trouble has developed due to a change in the characteristic of the blast furnace dust. While dust which previously had gone to treater units was well oxidized, the dust passing through the cooling tower to the baghouse is not oxidized to the same degree. Some metallic fume, principally lead, is present and the dust is rendered much more pyrophoric. An early solution to the flue dust treatment problem is anticipated

32260

Lepsoe, Robert

HISTORY OF THE TRAIL SMELTING PLANTS. (Historien om Trail smelteverk). Text in Norwegian. Tidesskr. Kjemi Bergvesen Met., 7(2):22-25, Feb. 1947.

The history of this plant, located in the Canadian province of British Columbia, on the Columbia River just north of the U. S. border is reviewed. The plant produces metallic lead, zinc, cadmium, gold, tin, elemental sulfur, and sulfur dioxide gas (for commercial use). At an earlier period, the company had serious problems with lead poisoning among its workers, but the institution of regular checkups, including blood tests, of workers in contact with lead, combined with proper medical treatments and other personnel policies, has almost eliminated the problem. Extensive research has been done at the plant on the problem of recovering sulfur products from the roasting gases. Among the absorption media tested are zinc oxide, limestone, basic aluminum sulfate, and organic bases. Granulated lead slag has been found extremely effective as an absorbing agent, but at the same time its use is not economically profitable. The basic decision of plant management was to recover sulfur dioxide in a form in which it could be converted to elemental sulfur or sulfuric acid. Reducing SO2 with coke is complicated by the fact that coke is so expensive locally. On the other hand, there is an abundance of carbon monoxide available from thermo electric plants, which can be substituted for the coke.

32319

Konopka, A. P.

PARTICULATE CONTROL TECHNOLOGY IN PRIMARY NON-FERROUS SMELTING. Preprint, American Inst. of Chemical Engineers and Inst. Mexicano de Ingenieros Quimicos, 10p., 1970. 9 refs. (Presented at the American Institute of Chemical Engineers and Institute Mexicano de Ingenieros Quimicos Joint Meeting, 3rd, 0Denver, Colo., Sept. 1970.)

The sources and nature of particulate emissions and control technology in the primary smelting of aluminum, copper, lead, and zinc are described. The high dust concentrations generated by bauxite drying and alumina calcining frequently require multicyclones for preliminary collection, followed by electrostatic precipitation. Installed costs for the combined system are $4.60-$2.30/CFM, at 99+% collection efficiencies. Electrolytic aluminum reduction cells pose a more complicated emission problem: moderate-energy wet scrubbers, glass filter bags, or flushed precipitator installations are used. Representative installed costs for the three methods are $3.00/CFM, $2.00/CFM, and $2.00/CFM, respectively. Dry electrostatic precipitators, preceded by mechanical collectors, are universally applied in copper smelting. Installation costs for the combined equipment are $6.00/CFM for 50,000 CFM flows and $2.00/CFM for 2,000,000 CFM flows. Large lead blast furnaces employ electrostatic precipitators, smaller units use fabric filters. Installation costs of vertical flow pipe-type precipitators in the 100,000 CFM range are $6.00/CFM. Continuous baghouses for smaller volumes cost $5.00/CFM installed. Horizontal flow plate precipitators are used on new zinc sintering machines. Mild-steel construction is common, and installed costs for 50,000 CFM collectors are $3.50/CFM. Emissions from flash roasting of zinc ore are also controlled by plate-type precipitators of mild steel construction. Installed costs are $3.50/CFM.

32760

Schulz, Ulrich and Ulf Richter

THE INFLUENCE OF TECHNOLOGICAL PARAMETER ON THE COLLECTION EFFICIENCY OF ELECTROSTATIC PRECIPITATORS IN NON-FERROUS METALLURGY. (Einfluss technologischer Parameter auf den Abscheidegrad von Elektrofiltern in der NE-Metallurgie). Text in German. Neue Huette, 16(7):385-390, July 1971. 13 refs.

Experiments were conducted with a hot gas electrostatic precipitator to determine efficient design criteria for application to the non-ferrous metallurgical industry. A sample flow was drawn through the precipitator from waste gases coming from copper, tin, zinc, and lead furnaces. Dust which had remained in the gas after passage through the precipitator was removed with a glass fiber reinforced asbestos paper filter. Efficiency measurements, resistance determinations, and theoretical considerations revealed that the filter temperature and water content of the gases influence the collection efficiency by relationships which are controlled by the specific electric resistivity of dust. In the case of dusts with a resistivity of less than 10 to th 10th power ohm/cm, temperature and dew point influence the collection efficiency via the breakdown voltage and the gas viscosity, regardless of the dust resistivity.

35296

Ichijo, Michio

JAPAN TODAY: POLLUTION-FREE METALLURGY. Mining Mag. (London), 125(5):471-474, Nov. 1971. 10 refs.

A pollution-free process for recovery of various metals from Kuroko ore is described. The ore is first separated by a flotation process to produce copper, lead, zinc, iron, and slime bulk concentrates, plus tailings. The copper concentrate is then treated by a dry method for extraction of crude copper. Iron concentrate is treated by the Kohwa process to obtain hematite pellets. Lead and zinc dust from the copper concentrate and vaporized copper, lead, and zinc chlorides from the iron concentrate are treated in a gas-absorbing neutralization tank and then separated from the transparent solution by precipitation. Lead and zinc concentrates and slime bulk concentrates are oxidized and leached with ferric chloride solution, separating the precipitate from the transparent solution. Sulfur is precipitated as elemental sulfur, then the leached residue is recycled to the flotation process. The transparent solution, after leaching with ferric chloride, contains copper, lead, zinc, and other metallic ions. High purity metals are obtained by amalgam phase exchange in combination with amalgam electrolysis.

35478

Aizenberg, B. Sh., A. G. Belikov, D. L. Bukhanovskii, G. M. Gordon, V. P. Kovalev, G. A. Matrakhin, Ya. V. Mishurin, and V. N. Tsessarskii

OPERATION OF A BAG FILTER WITH AIR JET FABRIC CLEANING. Soviet J. Non-Ferrous Metals (English translation from Russian of: Tsvetn. Metal.), 42(8):44-48, Aug. 1969. 1 ref.

The operation of bag filters with air jet cleaning to control the dust content of waste gases was tested on lead smelting shop exhaust gases in a pilot plant study. Components of the system, operating procedures, and variable operational factors were examined. Test results and design criteria are included. The experimental filters produced dust outputs of 3.20-7.50 mg/n cu m, 2.0-3.6 mg/n cu m, and 4.3-7.3 mg/n cu m under different conditions.

37750

Schulz, Ulrich and Ulf Richter

INFLUENCE OF TECHNOLOGICAL FACTORS ON THE DEGREE OF SEPARATION OF ELECTRIC FILTERS IN NON-FERROUS METALLURGY. (Einfluss technologischer Parameter auf den Abscheidegrad von Elektrofiltern in der NE-Metallurgie). Text in German. Neue Huette, 16(7):385-390, July 1971. 13 refs.

The flying dust generated in non-ferrous metallurgical furnaces is mostly composed of oxidized particles of zinc, lead, tin, antimony, and arsenic. Sheet-type filters and electrostatic precipitators are used for removal and recovery of these dust types. Due to the generally high specific electric resistance of the dust, the process can be carried out effectively only by adhering to certain values of precipitation temperature and water content of the gas phase. To establish design parameters for the construction of precipitators for the non-ferrous metal industry, the precipitation rate of waste gases derived from various metallurgical furnaces for copper, zinc, tin, and lead was measured by a laboratory-type electrostatic precipitator. The influence of precipitation temperature and water content of the gas phase on the precipitation rate was investigated. The results of measurements of precipitation rates and electric resistance of the separated dust material, in combination with theoretical considerations, lead to the conclusion that with dust of a specific electric resistance of less than 10 to the 10th ohm cm, the precipitation rate is influenced by temperature, dew point of gas, viscosity of gas, and voltage of electric field, independent of the specific electric resistance of the

dust. Above 10 to the 10th and up to 10 to the 11th ohm cm, the precipitation rate is related to the specific electric resistance of the dust.

40760

Bureau of Mines, Washington, D. C.

CONTROL OF SULFUR OXIDE EMISSIONS IN COPPER, LEAD AND ZINC SMELTING. Bureau of Mines Information Circ., no. 8527:1-62, 1971 6 refs.

Removal of sulfur oxides from copper, lead, and zinc smelter gases will require substantial capital investment. The copper smelting industry anticipates expenditures of $600 million in order to conform to a 10% standard. The lead and zinc industry is expected to spend at least $100 million. According to industry specialists the smelting cost of copper may rise 4 cents/lb from current levels of 4 to 6 cents/lb. Lead is expected to increase 2 to 4 cents over the current cost of 2 cents/lb. Zinc may increase 1.5 cents/ lb from its current price of 6 cents/lb. Companies may find it difficult to pass the cost on to the ultimate consumer. Controversy has arisen between the metals industry and governmental control agencies over the status of stack gas desulfurization processes. New markets for sulfuric acid produced during effluent gas scrubbing must be discovered. Air pollution regulations and emission standards are mentioned. Sulfur dioxide control methods include tall stacks, conversion to H_2SO_4 by the contact method, absorption, lime and limestone scrubbing to yield sulfur compounds, and reduction of SO_2 to elemental sulfur.

D. AIR QUALITY MEASUREMENTS

03410

A STUDY OF AIR POLLUTION IN MONTANA JULY 1961 - JULY 1962. Montana State Board of Health, Helena Division of Disease Control. 1962. 110 pp.

The principal pollutants in the air were determined with the staff and analytical equipment available to the State Board of Health and some idea as to the carcinogenic potential of the materials in the air in the various cities as well as the over-all characteristics in each of the cities were determined as a baseline for future reference. Emission inventories are included.

07132

Zykova, A. S.

POLLUTION OF ATMOSPHERIC AIR WITH LEAD AND ITS EFFECT ON THE HEALTH OF THE POPULATION. U.S.S.R. Literature on Air Pollution and Related Occupational Diseases, 7:55-62, Jan. 1960. (Also published in ((Gigiena i Sanit.,)) 22(2):12-17, 1957.) Translated from Russian. CFSTI: TT 60-21049

The pollution with lead-containing discharges by accumulator and lead smelting plants was found to be of permanent character. Lead was found in 73-97% of the air samples tested. The total quantity of lead liberated into the air by the discharges of the accumulator plant under normal conditions of production amounted to 5.7 kg/day and by the discharges of the lead smelting plant to 14.8 kg/day. The average daily concentration of lead at a distance of 500 - 700 meters from the storage battery plant was 3 - 4 times as great as the 0.0007 mg/cu m upper limit adopted as the allowable concentration. At a distance of 1500 meters from the lead smelting plant the average daily concentration of lead was 5 to 6 times as great as the limit of allowable concentration. The lead penetrated into the living quarters and community dwellings where its concentration in the indoor air was 3 to 5 times as great as the limit of allowable concentration. Analysis of the dust settled inside living dwellings showed that lead accumulated within living premises, creating an indoor source of lead pollution. Polyclinic examination of a group of old inhabitants of the region showed that the frequency of occurrence of functional neurological and gastro-enteric disturbances among them was many times greater than among a control coming from a region free from such pollution-68 the same was true of the frequency of occurrence of functional cardio-vascular disturbances. The quantity of lead found in the urine of persons living in the industrially air-polluted region indicated that many inhabitants carried within them high concentration lead deposits. Results of a histochemical study pointed to the existence of a lead accumulating process among the residents of the industrially air-polluted region, which progressively increased with the continued residence in such lead polluted regions.

10517

Robinson, E. and R. C. Robbins

SOURCES, ABUNDANCE, AND FATE OF GASECUS ATMOSPHERIC POLLUTANTS (FINAL REPORT.)Stanford Research Inst., Menlo Park, Calif., SRI-P 6755, 123p., Feb. 1968. 120 refs.

An analysis of the sources, abundance, and fate of gaseous atmospheric pollutants is presented, considering three families of compounds: sulfurous, nitrogenous, and organic; and two inorganic carbon compounds: carbon monoxide and carbon dioxide. With the exception of CO2, similar patterns of analyses of these materials a followed and rather detailed analyses are produced. The presentati of CO2 is only a brief review of the current state of thinking. Included are estimates of annual world-wide emissions of pollutants SO2, H2S, CO, NO2, NH3, and organics. The magnitudes of the natura emanations of a variety of materials have also been considered, although the means of estimating these emissions are very crude because so little study has been made of emissions from other than urban air pollution sources. Sulfur compounds, in the form of SO2, are currently the most topical of the numerous air pollutants. Sulfur enters the atmosphere as air pollutants in the form of SO2, H2S, H2SO4, and particulate sulfates; and as natural emanations in the form of H2S and sulfates. Among the various sources of CO, automobile exhaust accounts for more than 805 of the estimated worl wide CO emission. The major sources for the gaseous nitrogen compounds are biological action and organic decomposition in the so and perhaps in the ocean. Aerosols containing NH4 ions and NO3 ion are formed by atmospheric reactions involving the various gases. Major contributions of hydrocarbons include natural CH4 emissions from flooded paddy areas, terpene-class organics evolved by vegetation, and pollutant emissions. A brief review of present understanding of CO2 in the atmosphere indicates a clear example of situation where pollutant emissions are significant enough to cause measurable changes in the ambient concentrations.

E. ATMOSPHERIC INTERACTION

12777

McKee, Arthur G. and Co., San Francisco, Calif., Western Knapp Engineering Div.

SYSTEMS STUDY FOR CONTROL OF EMISSIONS. PRIMARY NONFERROUS SMELTING INDUSTRY. (FINAL REPORT). VOLUME III: APPENDICES C THROUGH G. Contract PH 86-65-85, Rept. 993, 114p., June 1969. 130 refs. CFSTI: PB 184 886

A systems study of the primary copper, lead, and zinc smelting industries is presented to make clear the technological and economic factors that bear on the problem of control of sulfur oxide emissions. Various sulfur oxides control methods, including scrubbing, absorption, and reduction, are matched with smelter models to determine optimum control and production combinations. A precise analysis of the pollution potential of an individual smelter requires meteorological data for the specific smelter site. The variables that can be considered in such a topographical analysis include inversion frequencies, monthly mean maximum mixing depths, surface winds, and general airflow conditions. An analysis of the U. S. markets for zinc, lead, and copper is presented, as well as markets for sulfur byproducts. A literature review of control methods for sulfur oxide emissions from primary copper, lead, and zinc smelters is included.

F. BASIC SCIENCE AND TECHNOLOGY

13534

Mackiw, V. N.

CURRENT TRENDS IN CHEMICAL METALLURGY. Can. J. Chem. Eng., 46(1): 3-15, Feb. 1968. 52 refs.

Recent developments in hydrometallurgy and pyrometallurgy are reviewed. Some processes presently in commercial operation and some in the developmental stage are presented from the standpoint of extraction of metals and from their fabrication into useful materials. The chemical reactions of various commerical processes are shown both graphicaily and chemically. New processes are presented for the treatment of Zn Cu, and Pb concentrates, complex Pb-Zn, Cu, FeS2 bulk concentrates, and Zn plant residues. A combination of roasting and hydrometallurgy for the recovery of molybdenum from molybdenite is displayed diagramatically. Laterite treatment and other investigations and reactions are reviewed. It is concluded that new products from new processes will evolve economically through a new technology.

13552

Oldright, G. L. and Virgil Miller

SMELTING IN THE LEAD BLAST FURNACE. Trans. AIME (Am. Inst. Mining Metallurgical and Petroleum Engrs.), Vol. 121, p. 82-105, 1936. 3 refs.

Experimental work from 1931 to 1936 related to the increased capacity of the blast furnace was reviewed. Three lead smelters treating three distinctive types of lead including a rich lead charge and a charge high in zinc were considered. Methods of preparation for the blast furnace, as in double sintering, were examined, particularly with respect to chemical composition and size of the feed. Experiments to improve sintering practice involved finding the optimum bedding on pellets according to particle size, and analyzing ignition of the bedding charge, moisture in the charge, recirculation of gases, and size of beds. The reducing power of the blast furnace gases was considered in terms of the producer-gas reaction, CO2 plus C yields 2CO.

G. EFFECTS-HUMAN HEALTH

03893

K. Tsuchiya, D. Tanaka, M. Nishimaru, K. Sho, and N. Sato

LEAD CONTENTS IN ORAL CAVITY OF LEAD WORKERS AND LEAD INTAKE INTO THE BODIES. Japan J. Ind. Health (Tokyo) 1,(2) c 5-8, Apr. 1959. Text in Jap.

The lead content of the mouth of lead workers in a storage battery and a lead refining plant was estimated and was compared with the blood lead contents, whole blood gravity, and coproporphyrinuria. The oral lead was estimated in samples of the tooth calculus or coating, and also in samples of 30cc of 0.5% acetic acid solution, used as a mouth wash for the workers. It was found that the lead contents of tooth calculus and coating was approximately 3 to 120 micrograms per 100 mg. Little lead was recovered from saliva from the parotid gland. The lead content of tooth calculus and coating showed no correlation with that of blood lead. Therefore, it is logically assumed that the oral lead of the lead workers is of environmental origin and not from the lead absorbed in the body. The lead content of the used mouth wash solution of the workers indicated a high correlation (r= -3.71) with the whole blood gravity, which is one of the best indicators of the chronic lead intake. The lead content of the mouth wash solution must be directly influenced by the lead concentration of the environmental air. (Author summary modified)

11630

Antal, Andrei, Jeanette Timaru, Elena Muncaci, Ecaterina Ardevan, Ala Ionescu, and Lia Sandulache

VARIATIONS OF THE ORGANISM REACTIVITY AND THE STATE OF HEALTH OF CHILDREN IN REGARD TO TOWN AIR POLLUTION. (Les variations de la reactivite de l'organisme et de l'etat de sante des enfants en rapport avec la pollution de l'air communal). Atmos. Environ., 2(4):382-392, 1968. 33 refs. Franklin Inst. Research Labs., Philadelphia, Pa., Science Info. Services, 20p.

Organism reaction and state of health of the child population in a metallurgical center where atmospheric lead concentrations exceeded prevailing sanitary standards was studied in various investigations (clinical, somatometric, capillaroscopic, nerve reactivity, adaption disturbance, psychometric, etc.) In a parallel manner, children in a control city where the air was relatively pure were examined. The observations were made on varying numbers of children, according to the kind and character of the tests. Antropometric tests were applied to 2310 children, dynamometric to 1702, capillaroscopic to 1658, and tests of neuropsychic activity to 258-948 children. The data obtained indicate a decreased resistance of the respiratory apparatus to pathogenic agents on the part of the children in the polluted city. In particular, upper respiratory tract infections, pneumonia and bronchopneumonia, anemia, anitaminosis, rachitis, disorders of the digestive tract, and dental decay were more frequent by 9 to 31%. In addition, the children exhibited poorer psychical and physical development, more frequent adjustment problems, reduced scholastic performance, and greater frequency of aberrant capillaries. The degree of air pollution reaction differences was found to be related not on the extent of pollution, but also to the degree of development, sex, age, biological condition of the subjects, and duration of exposure. Sensitivity was greater in girls and preschool children, and proportional to the length of exposure to pollutants.

20220

Gusev, M. I.

NEW STUDIES ON THE EFFECT OF LOW LEAD CONCENTRATIONS ON THE HUMAN ORGANISM. In: Limits of Allowable Concentrations of Atmospheric Pollutants. V. A. Ryazanov (ed.), Book 5, Washington, D. C., U. S. Public Health Service, March 1962, p. 19-28. 19 refs. (Translated by B. S. Levine.)

In view of existing disagreements on the mechanism of porophyrin metabolism disturbances caused by exposure to lead, urine samples from 100 children living in the vicinity of a cable plant and from 11 children living in the vicinity of a lead smelting plant were analyzed for coproporphyrin. The results were compared with coproporphyrin elimination in 100 children living in a section of the city free of lead discharging industrial plants. Coproporphyrin eliminated in the first group of children ranged from 3.38 to 15.80 micron, with an average of 8.19 micron per eight-hr period. The minimum coproporphyrin elimination in the group exceeded that of the control group by 1.5 micron; the maximum, by 4.11 micron; and the average, by 1.69 micron. The average diuresis was 244 ml. Among the children from the area of the smelter, the average diuresis was 257 ml. Corproporphyrin ranged from 3.87 to 31.07 micron, with an average of 10.74 micron. As compared with the control group, minium indexes rose by 2.03 to 3.87 micron and maximum, by 11.05 to 31.07 micron. In the control group, coproporphyrin was 2.03 to 11.05 micron. The amount eliminated per eight-hr periods was about 6.5 micron, with an average diuresis of 223 ml. In further studies, the average urinary lead content of 56 children residing near a lead smelter was found to be 0.023 mg/l as compared with 0.015 mg/l in control children.

20221

Shalamberidze, O. P.

LIMITS OF ALLOWABLE CONCENTRATION OF LEAD SULFIDE IN ATMOSPHERIC AIR. In: Limits of Allowable Concentrations of Atmospheric Pollutants. V. A. Ryazanov (ed.), Book 5, Washington, D. C., U. S. Public Health Service, March 1962, p. 29-38. 12 refs. (Translated by B. S. Levine.)

Limits of allowable lead sulfide concentrations were developed on the basis of determinations of actual concentrations present in the air around a lead ore concentrating plant and studies of the effect of exposure to lead sulfide in laboratory animals. The concentrations of lead ranged from 18.8 micrograms/cu m at a distance of 250 meters to 1.3 micrograms/cu m at 500 meters; the concentrations of lead-containing dust, from 1.24 micrograms/cu m at 250 meters to 0.69 micrograms/cu m at 500 meters. Distribution of the lead sulfide was found to be influenced by wind velocity and direction, as well as by atmospheric precipitatio Analysis of lead ore concentrate dust

showed that its toxic component was PbS. Rats exposed to 48.3 micrograms/cu m of ore dust six hours daily for six months exhibited conditioned reflex shifts, which differed with the typological characteristics of the rat's higher nervous activity pattern. No shifts in higher nervous activity were observed in rats exposed to 13.5 micrograms/cu m of lead sulfide. Brain tissues of exposed rats showed the presence of dystrophic changes in isolated ganglia cells. No changes attributable to lead poisoning were seen in internal organs or blood. It is suggested that the allowable 24-hr concentration of lead sulfide be set at 1.7 micrograms/cu m and that the lead ore concentration plant be surrounded by a sanitary clearance zone not less than 500 meters wide.

24428

Noweir, Madbuli H. and Emil A. Pfitzer

EVALUATION OF COPROPORPHYRIN IN URINE FROM WORKERS EXPOSED TO LEAD. Am. Ind. Hyg. Assoc. J., 31(4):492-500, July-Aug. 1970. 51 refs. (Presented at the American Industrial Hygiene Association Conference, Denver, Colo., May 11-16, 1969.)

Studies were undertaken to evaluate the urinary coproporphyrin test as an economical routine method for identifying individual workers absorbing excessive quantities of lead and to evaluate the relationship between the concentration of coproporphyrin in urine and the concentration of lead in air. Lead was determined in particulate matter removed from 200 to 300 liters of air at a lead oxide plant, a lead soldering operation in a canning plant, two lead battery plants, and two lead smelters. Twenty-four hour samples of urine were collected from all the exposed 171 workers, and from a control group of 77 workers employed in an iron foundry and in a plastics molding plant. The average concentration of coproporphyrin in the urine of groups of workers increased with the average concentration of lead to which they were exposed. However, the correlation between atmospheric lead and coproporphyrin levels in urine did not appear to follow any simple curvilinear relationship, particularly for workers exposed to excessively high concentration of urinary coproporphyrin and periods of exposure. Only when the measurement of lead in blood cannot be obtained, the use of the relatively simple determination of coproporphyrin in urine and lead in air, together, but not separately, may provide the basis for reasonable hygienic control in the lead trades, if accompanied by the appropriate medical supervision. (Author abstract modified)

28452

Khachatryan, M. K.

ACCUMULATION OF LEAD IN TEST ANIMALS IN CONNECTION WITH AIR POLLUTION. (Nakopleniye svintsa v organizme podopytnykh zhivotnykh v svyazi s zagryazneniyem atmosfernogo vozdukha). Text in Russian. Gigiena i Sanit., no. 1:12-16, 1955. 7 refs.

Eighteen rabbits exposed for 3 months to polluted air in the vicinity of a nonferrous metallurgy installation were examined. Spectral analysis of bone, liver and muscle tissue revealed increased levels of lead in exposed animals. Eating food grown in the polluted area was demonstrated as a secondary route of heavy- metal intake.

28847

Smirnov, D. D.

X-RAY DETECTION OF LEAD-CARRIER STATE AMONG CHILDREN LIVING IN THE VICINITY OF A LEAD PROCESSING PLANT. (Vyyavleniye s pomoshch'yu rentgenografii nositel 'stva svintsa u detey, prozhivayushchikh v okrestnostyakh zavoda, pererabatyvayushchego svinets). Text in Russian. Gigiena i Sanit., 27(10):8-11, Oct. 1962. 10 refs.

X-ray examination of 511 children attending kindergartens and nurseries in the vicinity of a lead processing plant revealed infiltration bands due to lead at zones of preliminary calcificatio in thigh, shin, forearm, and hand bones in 64 cases. Significant levels of urinary lead were found in 21 cases, trace amounts in 6. Analysis of 60 soil samples showed 0.056-0.81% lead, while 15 cabbages grown in this soil contained lead in amounts of 0.152-0.4% ash content.

31528

Engel, R. E., D. I. Hammer, R. J. M. Horton, N. M. Lane, and L. A. Plumlee

ENVIRONMENTAL LEAD AND PUBLIC HEALTH. Environmental Protection Agency, Research Triangle Park, N. C., Air Pollution Control Office, APCO Pub-AP-90; 34p., March 1971. 79 refs. NTIS: PB 199058

The major public health problems associated with lead in the environment and the respective roles of the Department of Health, Education, and Welfare and the Environmental Protection Agency are briefly summarized. A discussion of lead metabolism and toxicology in man includes absorption, intoxication, and a presentation of areas for further research. Lead in the diet and in consumer goods is traced to natural sources, such as fruits, vegetables, and fish; the drinking water, through water supplies and water pipes; and manufactured sources, i.e., ceramic glazes, moonshine, color additives and hair dyes, and cigarettes. Lead in the air is covered by discussions on the distribution of ambient lead particles; the relationship of particle size to deposition in the lungs; sources of atmospheric lead, such as primary and secondary lead smelters, other industries, combustion of coal and fuel oil, incineration, and automotive exhaust; measurement of atmospheric lead through sample collection and analysis; and atmospheric surveillance. Lead in occupational exposures, specifically small shops operations, and its reporting for diagnosis, and lead poisoning in children are examined. Proposed community control programs are presented.

32842

McCaull, Julian

BUILDING A SHORTER LIFE. Environment, 13(7):2-15, 38-41, Sept. 1971. 48 refs.

Cadmium pollution of the environment is reviewed with respect to basic characteristics, emission sources, uses, concentration levels, and effects on human health. Cadmium dust, fumes, and mist are emitted during the refining of zinc, copper, and lead, as well as during extraction of cadmium. These processes released an estimated 2.1 million pounds (45% of total emissions) into the air in 1968. The single largest source was the roasting and sintering of zinc concentrates. Incineration or disposal of cadmium-containing products contributed 52% of total emissions. The processes included electroplating, recycling of scrap steel, melting down scrapped automobile radiators, and incineration of solid wastes. Cadmium concentrations in the waterways, tap water, food, vegetation, soils, and certain commercial products (fertilizers) were determined. The toxicity of cadmium, levels of ingestion and retention in the body, and correlation with hypertension, liver damage, bone disease, emphysema in industrial workers, cancer, and kidney impairment are examined.

34709

Williams, Michael

LEAD POLLUTION ON TRIAL. New Scientist Sci. J., 51(768):578-580, Sept. 9, 1971. 7 refs.

Because it has a long biological half-time in the body, lead is a cumulative agent. However, this renders lead less hazardous, for it allows time for measurement, assessment, and suitable action, if necessary. The central nervous system may certainly be involved in severe lead poisoning, but again there is no evidence that it is affected by lower levels of lead absorption, either in adults or in children. While rising lead contamination could be a factor in mental illness, which has also been indicated to be increasing particularly among the young, little actual evidence has been produced to indicate that either lead contamination or mental illness is increasing. It is misleading to imply that certain industrial areas have higher lead levels due to automobile emissions than non-urban areas when industries such as a single lead smelter could be equally at fault.

34850

Myerson, Ralph M. and John E. Eisenhauer

ATRIOVENTRICULAR CONDUCTION DEFECTS IN LEAD POISONING. Am. J. Cardiol., vol. 11:409-412, March 1963. 7 refs.

Two lead smelters hospitalized with lead poisoning manifested disturbances in atrioventricular conduction. In one patient, the lead levels were highest. A gradual return to a normal interval occurred during hospitalization and following edathamil calcium disodium (EDTA) therapy. In the second patient, ectopic atrial pacemakers, at times associated with prolongation of the P-R interval, dominated the electrocardiographic abnormality. The electrocardiogram returned to normal after hospitalization and EDTA treatment. Recurrences followed re-exposure to lead. Increased vagal tone produced by lead appears the most likely mechanism for the conduction effects. Blood lead values and 24-hr urinary values during EDTA treatment are tabulated.

35704

Stoefen, Detlev

POLLUTION OF THE ATMOSPHERE WITH LEAD AND ITS EFFECT ON PUBLIC HEALTH. (Die Verunreinigung der atmosphaerischen Luft mit Blei und ihr Einfluss auf die Gesundheit der Bevoelkerung). Text in German. Zentralbl. Arbeitsmed. Arbeitsschutz (Darmstadt), vol. 13:39-40, Feb. 1963.

A storage battery factory in Germany was found to emit 5.7 kg lead into the atmosphere in 24 hours; a tin smeltery, 14.7 kg. The median daily lead concentration 500 to 700 m from the battery factory was four times the maximum permissible level of 0.0007 mg/cu m; 1500 m from the tin smeltery the atmospheric level was six times the maximum permissible level. High concentrations also prevail inside the plants. Persons exposed for long periods of time to a lead-polluted atmosphere manifested a higher than normal incidence of gastrointestinal, cardiovascular, and nervous diseases. Tissue studies on chickens have disclosed that lead is accumulated in the organism. Removal of lead from industrial emissions by electrofilters must therefore be strictly enforced. Cases of lead poisoning of children living in the vicinity of a lead smeltery are reported. In one case 100 micrograms/% lead were found in the blood and 520 micrograms/% coproporphyrin in the urine.

H. EFFECTS-PLANTS AND LIVESTOCK

10318

C. Iosif

ACUTE AND CHRONIC LEAD POISONING IN CATTLE. ((L'intoxication augue et chronique par le plomb chez les bobins.)) Text in French. Rec. Med. Vet. Ecole Alfort (Par- is), 142(2):95-106, Feb. 1966. 23 refs.

Three cases of acute plumbism in cows are detailed: one of a six-year-old cow who accidentally ate about 100 gm of lead (in 1956); the second of a 12-year-old cow who accidentally ate a packet containing about 100 gm of lead used in painting; and the third of a three-week-old heifer who licked a freshly painted bucket. Route of exposure to lead can be gastrointestinal following deposition of lead fumes (lead oxide, sulfide, and sulfate) on pasturage and in exposed drinking water, or respiratory following the inhalation of such fumes. The presence of CO2 in the respiratory tract is thought to provide a favorable situation for the dissolution of lead and the formation of soluble lead complexes. One author has calculated that 12% of respired lead is absorbed into the organism, while only 1-2% of ingested lead is absorbed. In an industrial Romanian village, where the air is loaded with 104-125 mg of lead (by sedimentation method), the geographic and climatic conditions combine to pool the fumes from a lead refinery. The zone of pollution extends 1 km N.E. and 2 km N.W. of the town. Snow sampling reveals 0.4-7.02 mg/sq m/month of lead. The particulate pollution is believed to be about 1,200,000 per sq m at ground level, and up to 200,000 particles per sq m at 40 m above the ground. Cows raised in this area are estimated to eat 26 mg of lead in 100 gm of herbage, but near the plant they may eat 0.07-0.16% lead by weight. Poisoning (in eight chronic cases) is exhibited as cachexia, decreased milk production, pale mucosa, and enteritis with alternating constipation and diarrhea. More severe cases (12) exhibit colic, muscular twitches, and nervous complaints. Illness in these latter cases appears in 2-4 days, while, in the former cases, it may take a week or several months. Blood samples in two severe cases show the red blood cell level is decreased by almost 50%, as are the thrombocyte and hemoglobin levels. Prognosis in the described cases is routinely unfavorable, and the animals are sacrificed. Treatment in the severe cases is with EDTA (92 mg/150 kg body weight) as well as vitamins C and B1. Such therapy, used since 1963, will lower the plumbemia to 28%, and permits an economic use of the affected animals. Attention is drawn to providing fodder which is low in lead and rich in calcium, phosphorus, and vitamins; cows should not be pastured near lead factories and should not be watered with contaminated lake or stream water.

11467T

Miessner, H.

DAMAGE TO ANIMALS CAUSED BY INDUSTRY AND TECHNOLOGY. ((Schadigung der Tierwelt durch Industrie und Technik.)) Translated from German. Deut. Tierarztl. Wochschr., 39, p. 340-345, 1931. 26 refs.

Pollution of the air and damage to feed plants, and the resulting diseases of humans and animals, are extremely frequent in regions where ore-processing metallurgical plants are located. The fumes being produced during roasting and melting of the ore are usually bonded to sulfur and arsenic; consequently the smoke contains considerable quantities of SO2 and As2O3. This smoke most affects cattle. Acute arsenic intoxication becomes manifest in the form of vomiting and diarrhea, caustic injuries to the gastric mucosa, and fatty degeneration of the liver. In chronic cases, increasing cachexia, eczema and weakening resembling paralysis are observed. The metallic elements in the fly dust, moreover, can lead to harmful indigestion. During acute lead poisoning, stomach distress is observed, as well as spastic movements. Chronic lead intoxication leads to a general malaise combined with abortion, lead colic, muscular pain, epilepsy, and paralysis. The red blood corpuscles show a partial basophilic granulation. Hydrofluoric acid fumes from foundries and plants producing artificial fertilizers dissolve the calcium in the bones, and chronic calcium degradation and softening of the bones are the consequences. As a result of an air pollution episode in Luttich, damage by foundry smoke in fog caused hundreds of persons to fall ill and 63 to die, mostly within 1 to 2 days. Hardest hit were asthmatic and heart patients, and persons suffering from bronchitis. Copper intoxication was observed in sheep and cattle as a result of spraying orchards with lime and copper.

26276

Guss, Samuel B.

CONTAMINATION OF DAIRY FEEDS BY AIR POLLUTION. Milk Food. Technol., 33(12):553, 561, 567, Dec. 1970.

Where industry is encroaching upon land used for production of feed and forage crops, air pollution of forage for dairy cattle is already a serious problem. In Pennsylvania, lead poisoning and serious metabolic disease resulting from lime plant stack effluents have caused losses on dairy and beef cattle farms. Dairy cattle in the vicinity of lime plants have a very high incidence of milk fever, infertility, and bone abnormalities. Brood cows in a purebread beef cattle herd experienced ovarian cysts and osteopetrosis. Lime dust also affects the pH of the digestive tract to a great extent limiting digestion and absorption of some components of the diet. In two farms in Berks County, pastures close to lead smelters contained enough lead dust contamination on grass to kill cows. Effluents must be constantly monitored and the attitudes of the offenders must be changed by stiff penalties. Deposition of lead from gasoline exhaust may be an important factor influencing the health of animals living on farms along heavily traveled highways. Molybdenum and fluorine also have been involved in problems which have caused severe losses in a few cattle herds. (Author abstract modified)

27118

Hammond, P. B. and A. L. Aronson

LEAD POISONING IN CATTLE AND HORSES IN THE VICINITY OF A SMELTER. Ann. N. Y. Acad. Sci., vol. 111:595-611, 1964. 10 refs.

An outbreak of lead poisoning near a smelter is described. Fatalities in horses and cattle occurred. Data presented con-

cern the pattern and degree of contamination in animals and vegetation. The daily intake of approximately 6-7 mg Pb/kg appears to be close to the minimum which eventually gives rise to signs of poisoning in cattle. Horses appear to be somewhat more susceptible. Even under conditions of chronic lead intake, the syndrome in cattle generally is acute or per-acute. The concentration of lead in milk is linearly related to the concentration in blood cells at a ratio Pb cells/Pb milk of approximately 23. Evidence is presented indicating that relief of the burden of lead in tissues with EDTA therapy following chronic intake of the metal is a hazardous procedure. Data gathered by the Minnesota State Health Department during this episode indicate that people in the area and their wate supply were not affected. (Author summary)

28948

Pelz, Eberhart, Horst Beyer, and Gerhard Bleyer

THE DIAGNOSIS AND EFFECTS OF SMOKE DAMAGE IN THE VICINITY OF A LEAD SMELTERY. (Untersuchungen zur Diagnose und Wirkung von Rauchschadden in der Umgebung einer Bleihuette). Text in German. Wiss. Z. Tech. Univ. Dresden, 12(1):209-216, 1963. 10 refs.

The effects of extreme smoke emission from a lead smelting plant situated 340 m above sea level with a median yearly temperature of 7.7 C and an annual precipitation of 868 mm on the surrounding woods were studied by analyzing the air using the Liesegang method, by conimetric determination of dust emission, by soil analysis for the presence of arsenic, and by Haertel's turbidity test. A positive, statistically significant correlation coefficient (0.83) was found to exist between the number of dust particles per liter of air and the median sulfur content of air samples from nine locations. The damage to vegetation was greatest where continuous SO2 emission was compounded by considerable As soil concentrations. Deciduous trees were generally more resistant than conifers. Birches were most resistant of all tree varieties. Severe damage was confined to a distance of 1 km from the source.

32224

Schucht, F., H. H. Baetge, and M. Dueker

SOIL ANALYSES IN THE SMOKE DAMAGED AREA OF THE METALLURGICAL PLANT OKER IN UNTERHARZ. (Ueber bodenkundliche Aufnahmen im Rauchschadengebiet der Unterharzer Huettenwerke Oker). Text in German. Landwirt. Jahrb., vol. 76:51-98, 1932. 39 refs.

The metallurgical plants in Oker primarily emit sulfur dioxide, nitrous acid, and carbon dioxide. The effect of these emissions on the soil was determined by taking soil samples, profile samples, and individual samples at 42 points. The area has primarily clay soil interspersed with sand and gravel. The soil was studied to determine the absorption, permeability, and coherence. Hydrochloric acid extracts were analyzed to determine if changes had occurred because of the pollutants. With prevailing west winds, an extensive area receives the emissions from the metallurgical plants. In all samples, an enrichment of the sulfates (in the form of calcium sulfate) was found. This cannot cause soil damage since the quantities are too small. With the influence of SO2 and CO2, the soil loses its alkalinity. However, the soil contained so much calcium the SO2 became bound. Iron sulfates, which form only without alkalinity, could not be determined. Within a belt of one to one and one half km wide, hardly anything grew. This belt was followed by a zone (2 km from the emission source) where the root crops were still heavily damaged. Between three and three and one half km from the emission source, the effect of the pollutants was weak. Also the metals copper, lead, zinc, and arsenic were found in the soil; they are mostly insoluble, and thus are harmless compounds.

32736

Schmitt, Nicholas, Gordon Brown, E. Larry Devlin, Anthony A. Larsen, E. Douglas McCausland, and J. Maxwell Saville

LEAD POISONING IN HORSES. Arch. Environ. Health, vol. 23:185-197, Sept. 1971. 13 refs.

Five elements (lead, zinc, fluorine, arsenic, and cadmium) were investigated in the vicinity of a smelter; excessive amounts of lead in ingested forage were considered to be the primary cause of a chronic debilitating disorder in six horses. The high lead levels in forage were related to the presence of lead in surface soil accumulated from emissions of a nearby smelter. Young horses were found to have a significantly higher susceptibility to the effects of lead than older horses and cattle. The role played by high concentrations of zinc in local grasses is not fully understood. The possibility of a synergistic effect of zinc and other trace elements on animal health deserves further study. While elevated fluoride content in some of the grasses tested was evident, fluorosis was ruled out as a cause of illness in the affected animals. Testing of local ambient air and drinking water for all five elements studied showed values to be well within acceptable limits. The same applied to the testing of most locally produced foods of animal and vegetable origin. A few species of leafy vegetables were the only human foodstuffs in which, occasionally, significantly elevated contents of lead and some of the other trace elements studied were found. However, the possibility of any health hazard related to their consumption was considered extremely remote. Human urine specimens and cattle were also studied.

33112

Rains, D. W.

LEAD ACCUMULATION BY WILD OATS (AVENA FATUA) IN A CONTAMINATED AREA. Nature (London), 233(5316):210-211, Sept. 17, 1971. 12 refs.

Wild oats growing in the Benicia-Vallejo area, exposed for 70 years to lead emissions from a smelter, were examined for lead accumulation. Initially, during the period of rapid growth (April-June), the lead concentrations decreased, but then increased substantially during ripening until autumn, when the plants were completely air-dry. The increase continued, accelerating after heavy rains in October and November, and reached a peak in December. Lead contamination in the new growth (1970-1971) was similar to that in the early samples of the 1970 season. To investigate the effect of rain, a series of leaching experiments were conducted on dried straw. The results of the experiments are tabulated.

33331

Guenther, Hans

FEEDING EXPERIMENTS IN HORSES AND A SHEEP WITH FUME DEPOSITS FROM A LEAD WORKS IN GERMANY. (Fuetterungsversuche mit Flugstaub einer Metallhuette an Pferden und einem Schaf). Text in German. Tieraerztliche Hochschule, Hannover (Germany), Thesis (D. Vet. Med.), 47p., 1954. 38 refs.

The symptoms of three colts (swollen joints, weight loss, lead content in the liver of 0.2 .ng) who grazed in the vincinity of a lead smelter led to feeding experiments on a colt and one sheep. Straw obtained 1100 m from the lead smelter and fly ash with 44.79% lead, 8.20% sulfur, 0.22% arsenic, 5.21% zinc and 5.60% chlorine was fed to the animals. The colt received

15 to 20 g fly ash per day, the sheep 2 to 24 g. The experiments lasted for 3 months with the colt and for more than one month with the sheep. Toward the end of the experimental period, the colt suffered heavy paralysis which caused swallowing difficulties and, as a consequence, pneumonia. The lead content in the liver was significantly increased while that of the sheep remained the same. The joints of the colt were also damaged. In similar feeding experiments with fly ash from another plant, the clinical symptoms of lead poisoning wer absent and only the bones of the joints were damaged. This difference occurred because fly ash from the lead smelter contained almost three times as much lead as that from the other plant.

33362

Aronson, Arthur L.

BIOLOGIC EFFECTS OF LEAD IN DOMESTIC ANIMALS. J. Wash. Acad. Sci., 61(2):110-113, 1971. 21 refs.

Sources of lead and their effects on domestic animals are reviewed. A daily intake of six to seven mg/kg constitutes a minimum cumulative fatal dosage of lead for cattle, representing a concentration of approximately 300 ppm lead in the total diet. Horses grazing on pastures adjacent to a lead smelter were poisoned by eating hay containing 2.4 mg/kg/day of lead; the minimal toxic dose is 2 mg/kg/day. The horses, however, eat roots as well as forage, and the soil near the smelters contains more lead than the forage itself. Symptoms of lead poisoning include derangement of the central nervous system, gastrointestinal tract, muscular system, and hemopoietic system. The syndrome in cattle appears as depression, anorexia, colic, and maniacal excitement. Sheep exhibit depression, anorexia, abdominal pain, and diarrhea. Anemia is common during chronic ingestion. Horses knuckle at the fetlocks and have laryngeal paralysis. The effect of lead poisoning on the pregnant animal is discussed.

35880

Kerin, D.

DELIMITATION OF INDUSTRIAL EMISSIONS BY MEANS OF PLANT ANALYSIS. Protectio Vitae, 16(5):201-202, Oct. 1971. 13 refs.

Vegetation damage in areas surrounded by metallurgical and industrial plants are mainly caused by sulfur dioxide and fluorine compounds. Plants are much more sensitive than humans or animals to SO2. Many plant varieties show signs of damage at a concentration of 0.3 ppm SO2. Fluorine and it compounds are particularly injurious to cherries, grapes, plums, various ornamental plants, and vegetables. The Ontario variety of apples is very susceptible. Visible damage to buildings is also caused by this group of pollutants. For determination of the effect of the above pollutants on vegetation, needle samples were taken in September and October in polluted areas and compared to needle samples from unpolluted regions. First and second year needles were separated. Average samples were taken from 100 grams dried needles. Sulfate, lead, zinc, iron, and manganese were determined. Plants taken from the immediate vicinity of a glass work were heavily contaminated with fluorine. Concentrations of 4.0 to 25 mg F/kg dried basis were measured. The sulfur concentration was between 0.50 to 1.5% (natural concentration is 0.20%). The lead concentration ranged from 24 to 1.136 mg Pb/kg (natural concentration is 3.0 mg Pb/kg dried needles). The zinc content ranged from 136 to 495 mg Zn/kg dried needles; in unpolluted areas it is 28 to 75 mg Zn/kg.

39690

Ebaugh, W. Clarence

GASES VS. SOLIDS: AN INVESTIGATION OF THE INJURIOUS INGREDIENTS OF SMELTER SMOKE. J. Am. Chem. Soc., 29(7):951-970, July 1907. 4 refs.

The relative effects of sulfur dioxide and flue dusts in smelter smoke upon vegetation were investigated in the Salt Lake City area to assess the damages due to emission from lead and copper smelters. The concentrations of SO2 were monitored, and the effects of free SO2, sulfuric acid, SO2 in aqueous solutions, and dilute solutions of H2S04 were individually examined. Flue dust samples were analyzed for percent content of moisture, sulfur trioxide, iron, copper, insolubles (silicon dioxide), lead, arsenic, and zinc. Many repeated applications of SO2 in concentrations present in the air of a smelting district were needed to cause injury, the degree of which was dependent on humidity. Solutions of H2S04, if present to the extent of 1.38 g/l or stronger, caused marked corrosion. Solutions of flue dusts sprayed upon plants resulted in very severe corrosion. Soil mixtures containing 20% of the flue dust, when applied to plants, also caused very bad corrosion.

47766

Wentzel, Karl Friedrich

FINDINGS RELATING TO SMOKE DAMAGE BASED ON A STUDY OF THE EFFECTS OF DEFECT IN FILTERING AND ABSORPTION EQUIPMENT OF A LEAD SMELTERY. (Rauchschadenkundliche Lehren der Untersuchung von Wirkungen eines Ausfalles von Filter und Absorptionsanlagen einer Bleihuette). Wiss. Z. Tech. Univ. Dresden, 11(3):581-588, 1962. 23 refs. (Presented at the Working Session of Forestry Experts on Smoke Damage, 3rd Inter., Tharandt, West Germany, May 24-27, 1971.) Translated from German. Translation Consultants, Inc., Arlington, Va., 26p.

The research methodology of an investigation of smoke damage to forests near a West German lead smelter is discussed. A successful diagnosis of smoke damage to forests is dependent on an effective combination of various diagnostic methods. Proposals for the prevention, or at least a decrease in damages, should be inherent in determining the degree of damage caused by smoke to forests. A historical background to the problem of smoke damage to forests caused by smelting plants is presented, and installations to prevent emissions are considered. Descriptions or photographs of typical symptoms of damage may provide clear indications of acute effects, but they become truly valuable only for assessing smoke damage with regard to range, zoning, and intensity of damage, if they can be brought into correlation with the geography of the territory and local wind frequencies which depend on meteorological conditions. Chemical analysis of leaves, turbidity tests, soil analysis, and analysis of the atmosphere are discussed, in addition to determination of the degree of damage and prophylaxis and therapy.

J. EFFECTS-ECONOMIC

30696

LeSourd, D. A., M. E. Fogel, A. R. Schleicher, T. E. Bingham, R. W. Gerstle, E. L. Hill, and F. A. Ayer

COMPREHENSIVE STUDY OF SPECIFIED AIR POLLUTION SOURCES TO ASSESS THE ECONOMIC EFFECTS OF AIR QUALITY STANDARDS. VOL. I. (FINAL REPORT).

Research Triangle Inst., Durham, N. C., Operations Research and Economics Div., APCO Contract CPA 70-60, RTI Proj. OU-534, Rept. FR-OU-534, 395p., Dec. 1970. 328 refs. NTIS: PB 197647

Air pollution control costs for mobile sources are presented on a national basis and in terms of unit investment and annual operating and maintenance costs as well as total annual operating and maintenance costs. The analyses cover the estimated emissions and control costs for new cars for Fiscal Year 1967 through Fiscal Year 1976. Control costs for each stationary source, except for residential heating, are shown for 298 metropolitan areas by investment and annual expenditures by Fiscal Year 1976. The impact of control on selected industries and the Nation are also determined. Finally, an extensive bibliography is included. The pollutants from mobile sources selected for analysis are hydrocarbons, carbon monoxide, nitrogen oxides and particulates. The six pollutants for which control cost estimates are made for stationary sources are particulates, sulfur oxides, carbon monoxide, hydrocarbons, fluorides, and lead. Emission standards applied are considered stringent in comparison with many currently in use throughout the Nation. Mobile sources include automobiles and light and heavy-duty trucks. Stationary sources studied include solid waste disposal, commercial and institutional heating plants, industrial boilers, residential heating plants, steam- electric power plants, asphalt batching, brick and tile, coal cleaning, cement, elemental phosphorus, grain handling and milling (animal feed), gray iron, iron and steel, kraft (sulfate) pulp, lime, petroleum products and storage, petroleum refineries, phosphate fertilizer, primary non-ferrous metallurgy (aluminum, copper, lead and zinc), rubber (tires), secondary nonferrous metallurgy, sulfuric acid, and varnish. Data essential for defining metropolitan areas, emission control standards, and relevant process and air pollution control engineering characteristics required to support the cost analyses for each source and the cost impact on each industrial process are presented and analyzed in separate appendixes to this report. (Author abstract modified)

K. STANDARDS AND CRITERIA

02010

E.A.J. Mahler

STANDARDS OF EMISSION UNDER THE ALKALI ACT. Proc. (Part I) Intern. Clean Air Cong., London, 1966. Paper III/12). PP. 73-6.

The evolution of standards of emission under the Alkali Act over the past 100 years is briefly reviewed. The necessity for considering heights of discharge of pollutants as well as their concentration in the emissions and mass rates of discharge to atmosphere is stressed. It is also indicated that standards should be simply and clearly expressed in such a manner that their due observance can readily be checked by short and simple tests. An outline is given of the principles adopted in arriving at the current standards and these, both in regard to concentrations in emissions and heights of discharge, are listed. The aurhor expresses the personal view that present tendencies in ever increasing size of production units and complexity of operations on one site must inevitably lead to necessity in the future further to reduce emissions. Because of the cost of such a step he suggests that setting up and adoption of international standards is a desirable end. (Author abstract)

06581

RESTRICTING DUST AND SULPHUR-DIOXIDE EMISSION FROM LEAD SMELTERS. (Auswurfbegrenzung Bleihutten.) VDI (Verein Deutscher Ingenieure) Kommission Reinhaltung der Luft, Duesseldorf, Germany (Sept. 1961.) 29 pp. Ger. (Tr.) (VDI 2285.)

Descriptions of installations and processes for the production of lead which lead to the formation of sulfur dioxide and dust are presented. Factors influencing dust and sulfur dioxide emissions, means of reducing these emissions, and established limits and guide values for permissible dust emissions from new installations are discussed. A list of VDI Clean Air Committee specifications is given9

06778

(INDUSTRY AND ATMOSPHERIC POLLUTION IN GREAT BRITAIN.) Industrie et pollution atmospherique en Grande Bretagne. Centre Interprofessionnel Technique d'Etudes de la Pollution Atmospherique, Paris, France. (1967.) 6 pp. Fr. (Rept. No. CI 310.) (C.I.T.E.P.A. Document No. 24.)

A summary of the basis of governmental action in Great Britain in the struggle against industrial emissions is outlined. The regulations imposed by the 'Alkali Act' are in most cases based on 'the most practical means.' Standards are given for chimney heights. Statutory limits are given for various materials emitted such as hydrochloric acid, sulfuric acid, nitric acid, hydrogen sulfide, chlorine, arsenic, antimony, cadmium, and lead. The construction of tall buildings tends to reduce the benefits obtained by tall chimneys. A better knowledge of the effects of pollutants should be obtained so as not to burden industry with unnecessary expense in their control. It is urged that international standards for emission be adopted.
14443

Knop, W.

AIR POLLUTION CONTROL IN NON-FERROUS METAL INDUSTRIES. II. PARTICULATE AND GASEOUS EMISSIONS OF THE NON-FERROUS METAL INDUSTRY AND EMISSION STANDARDS. (Luftreinhaltung im NE-Metall-Betrieb. II. Staub-und gasfoermige Emissionen der NE-Metallindustrie und die Emissionsbegrenzung.) Text in German. Metall., 22(12):1266-1271, Dec. 1968. 21 refs.

In this review article, the West German air pollution laws and regulations as applied to metallurgical plants are compiled and discussed. In the aluminum industry, dust arises both in the production of aluminum oxide from bauxite and in the electrolytic furnaces. The most dangerous component of the waste gas is fluoride of which the maximum allowable concentration is 2.5 mg/cu m. Lead refineries emit considerable amounts of dust, up to 15 g/cu m waste gas, which contains metal compounds in the form of sulfates, oxides, sulfides, and coke dust. The pollutants originating in the various steps of lead production are discussed in detail. The threshold limit value (TLV) of lead is 0.2 mg/cu m. Electrometallurgical furnaces for iron and steel alloys emit very fine dusts (less than 0.4 micrometer), typically up to 250 kg/hr at 10,000 kva capacity. Metal oxides predominate, especially iron and silicon oxides. The waste gases of copper ore refineries contain mostly fly dust and sulfur compounds. The dust contains copper, zinc, and sulfur. Typical concentrations at various stages are listed. The TLV of copper is 1 mg/cu m. Emissions of zinc plants are listed, and waste gas and soot emissions of oil, coke, and coal furnaces are discussed in detail. Special problems are posed by scrap metal refineries, where plastics and varnishes cause air pollution. Typical examples are cited.

L. LEGAL AND ADMINISTRATIVE

06863

E. A. B. Birse

ONE HUNDRED AND SECOND ANNUAL REPORT ON ALKALI &C. WORKS, 1965. Ministry of Housing and Local Government, Edinburgh, Scotland, Dept. of Scottish Development. (Feb. 28, 1966). 91 pp.

The 102nd annual report on alkali and works was given to the Secretary of State for Wales, and to the Minister of Housing and Local Government, also to the Secretary of State for Scotland. The report, which is on the work done during the year 1965, in the reduction of air pollution by industrial processes, covers the following areas: (1) chemical and allied industries, (2) metal industries, (3) fuel industries and, (4) a group of miscellaneous works. Statistical information is included in appendices.

17927

Thayer, J. M.

THE CONTROL OF GRIT, DUST, AND FUME EMISSIONS FROM INDUSTRIAL PROCESSES. Conf. Filtration Soc., Dust Control Air Cleaning Exhibition, London, 1969, p. 10-15. 8 refs. (Sept. 23-25.)

Atmospheric pollution from industrial sources in England and Wales are controlled in part by the Clean Air Acts of 1956 and 1968 and the Alkali Act of 1906. The 1956 Clean Air Act prescribes standards for the emission of smoke from chimneys and prohibits smoke darker than Ringelmann 2, except for certain specified periods. The 1968 Act adds to this by prohibiting the emission of dark smoke from industrial and trade premises as distinct from chimneys. The 1956 Act deals with dust and soot only in general terms. The 1968 Act, covering emissions of grit and dust from furnaces, applies to a wide range of furnaces burning solid, liquid, or gaseous matter, excluding small domestic boilers. The recommended standards for furnaces burning fuel equivalent to 100 to 50,000 lb per hour of coal are illustrated graphically. Recommendations are also offered for reducing grit and dust emissions from cold blast cupolas at iron foundries. These involve minimizing emissions by suitable arrestors fitted at the top of the shaft or dispersing fumes from chimneys not less than 120-ft high. The Alkali Act is a measure to control emissions from virtually all the heavy chemical industries, the fine chemical industry, petroleum refining, and petro-chemicals, nonferrous metallurgy, iron and steel production, power stations, coke and gas works, and certain ceramic and lime works. The Act provides for the establishment of grit, dust, and fume emission standards and requires suitable equipment for obtaining these standards. Arrestment to a specific standard by dispersal of waste gases at inadequate height is given in some detail for cement works, iron and steel works, lead works, and electricity works.

44265

Gabrisch, R.

DEVELOPMENT AND EFFECTS OF LEGAL REGULATIONS CONCERNING METALLURGICAL PLANTS AND REMELTING PLANTS. (Entwicklung und Auswirkung behoerdlicher Auflagen fuer Metallhuetten und Umschmelzwerke). Text in German. Preprint, Gesellschaft Deutscher Metallhuetten und Bergleute, Clausthal-Zellerfeld (West Germany), 12p., 1972. (Presented at the Gesellschaft Deutscher Metallhuetten und Bergleute-Hauptversammlung, Stuttgart, West Germany, April 26- 30, 1972.)

One hundred and forty-four metallurgical plants and recasting plants existed in the Federal Republic and West Berlin in 1971. The total turnover was about one billion dollars, 0.8% of the entire industrial turnover. Despite this relatively small fraction of the total industrial turnover, the expenditures for air pollution control measures are remarkable. The new regulations which became effective in 1971 tie the licensing of all melting plants for non-ferrous metals to the presence of the most modern air pollution cleaning facilities. Vacuum melting plants and melting plants for up to 50 kg light metals or 200 kg heavy metals and melting plants for precious metals are excluded. In 1964 the Technical Directives for the Maintenance of Clean Air (TAL) were enacted. They demanded that the sulfur dioxide emissions by lead and zinc plants be reduced as far as possible by passing the roasting and sintering gases to a sulfuric acid production plant. The particulate emissions were limited to 400 mg/cu m during continuous operation for waste gases from lead blast furnaces, from lead reverberatory furnaces, and from zinc muffle furnaces. The particulate emission from lead refineries and zinc distillation plants was limited to 200 mg/cu m. Emissions from copper processing could contain as much as 500 mg/cu m dust. In 1966 this limit was reduced to 300 mg/cu m. For secondary aluminum plants a guideline is being worked out which will recommend the limitation of the particulate emissions from all melting aggregates to 150 mg/cu m and from thermal degreasing plants to 100 mg/cu m. In secondary zinc and copper plants, the maximum allowable emission will be limited to 50 mg/cu m because of the toxicity of zinc and copper. The metal recovery from old cables is connected with emission problems which still require a solution. At present no cable burning plant in Germany is equipped with any dust cleaning devices.

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